F·A·A·M facility for airborne atmospheric measurements

FLIGHT FOLDER

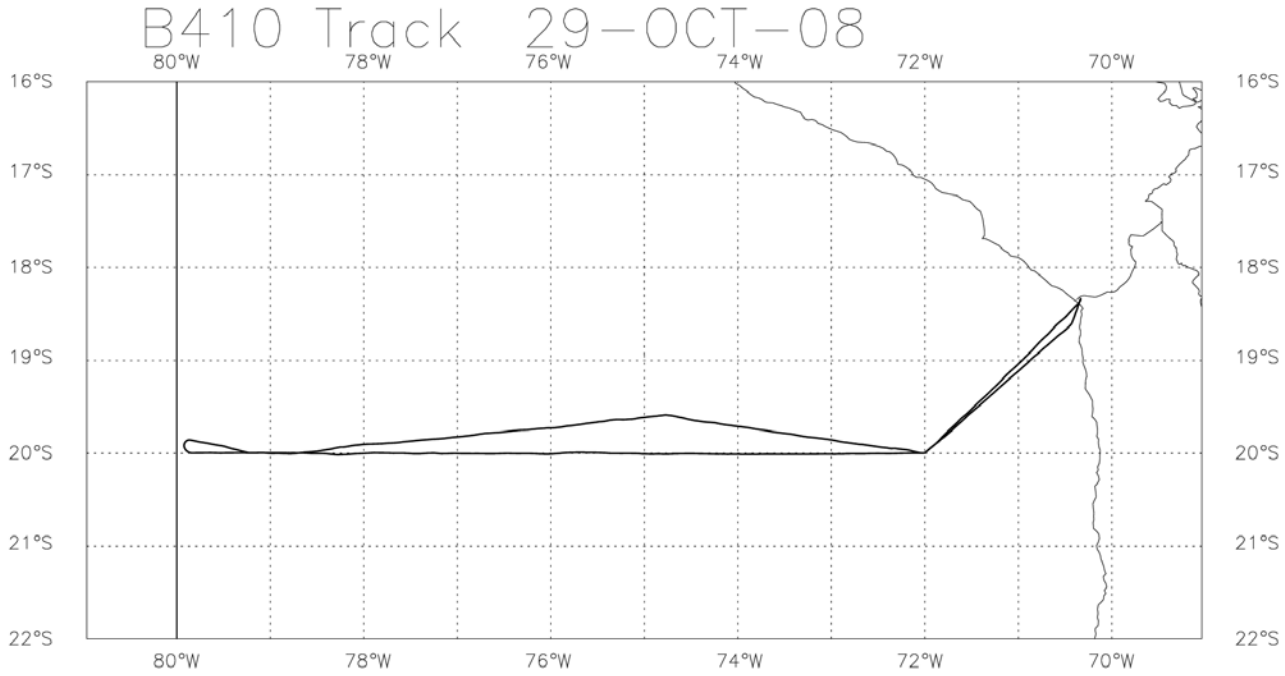
Flight No.	B410
Date:	29 Oct 2008
Take Off:	09:59:43
Landing:	15:16:13
Flight Time	5h 16m 30s

Campaign: VOCALS

Operating Area: South east pacific ocean off west coast of northern Chile

POB	Position	Name	Institute	Logs y/n
1	Captain	Alan Roberts	Directflight	
2	Co-pilot	Ian Ramsay Rae	Directflight	
3	CCM1	Tracey Hill	Directflight	
4	Mission Scientist 1	Keith Bower	Manchester University	
5	Mission Scientist 2	Phil Brown	Met Office	
6	Mission Scientist 3	Paul Barrett	Met Office	
7	Flight Manager	Jim Crawford	FAAM	
8	Core Chem /FTP	Doug Anderson	FAAM	
9	Cloud Physics	Martyn Pickering	Met Office	
10	SWS/SHIMS	Debbie O'Sullivan	Met Office	
11	CCN	Jamie Trembath	FAAM	
12	ARIES	Stuart Rogers	Met Office	
13	AMS/SP2	Paul Williams	Manchester University	
14	Wet neph/psap	Dave Tiddeman	Met Office	
15	VACC	Mark Bart	Leeds University	
16	Manchester cloud	Jonny Crosier	Manchester University	
17	CVI	James Bowles	Met Office	
18	MARSS	- unmanned -		

Flight Track:



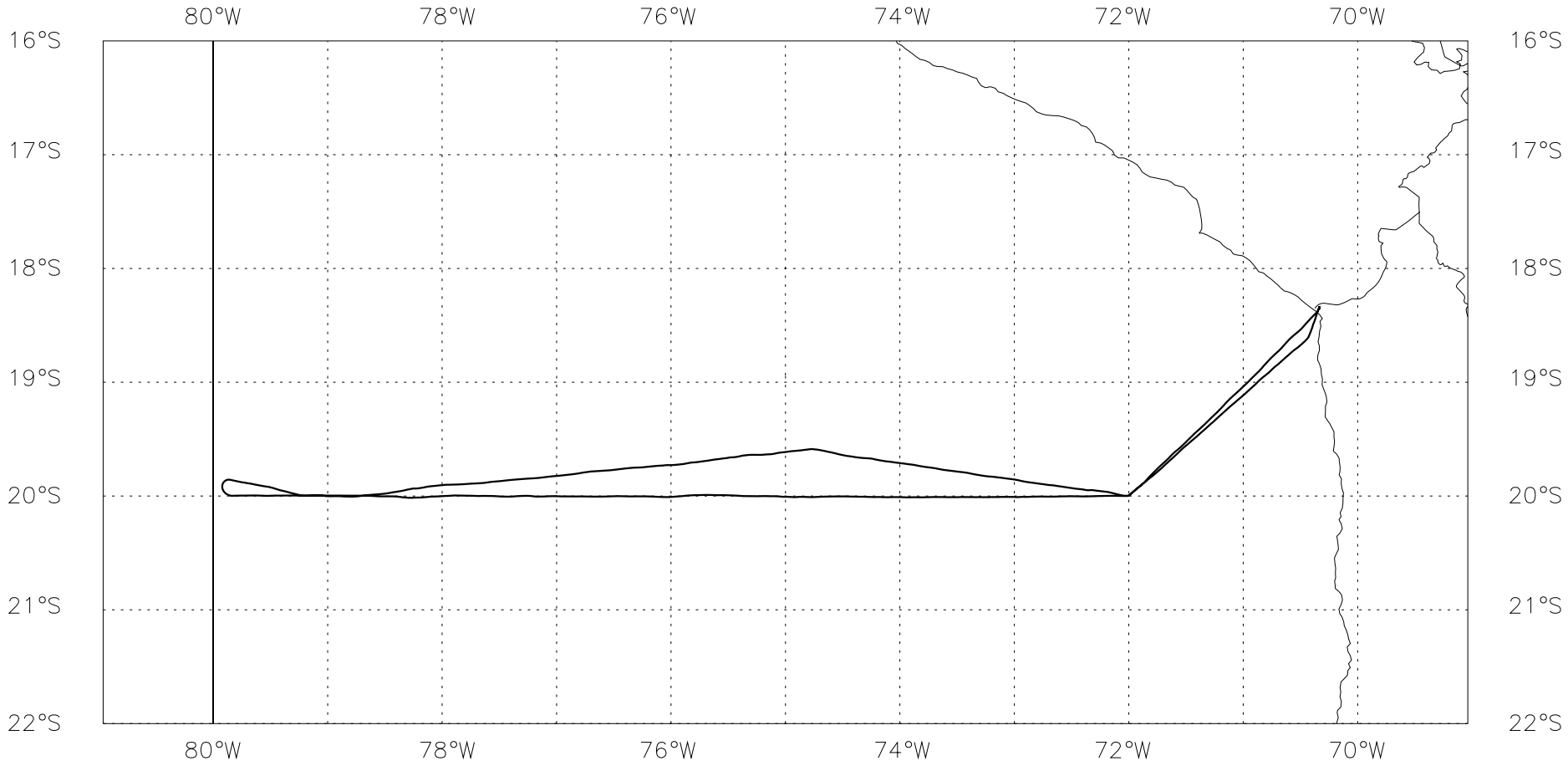
FLIGHT SUMMARY

Flight No B410
Date: 29 October 2008
Project: VOCALS
Location: South East Pacific off coast of Chile

Start Time	End Time	Event	Height (s)	Hdg	Comments
093127		gin	0.11 kft	023	started
095452		ASP	0.10 kft	018	open
095943		T/O	0.08 kft	198	Arica
100023	101012	Profile 1	0.56 - 10.0 kft	217	start at t/o
100229		heimann	2.7 kft	220	open
100337		cloud tops	3.8 kft	223	
100732		JW	7.5 kft	224	on
100820		JW	8.2 kft	224	zero
100835		Nev	8.5 kft	224	zero
100954		heimann	9.9 kft	221	cal06
101227		transit	10.0 kft	223	fl100
101342		twc	10.0 kft	226	power cycled
101803	102928	Profile 2	10.0 - -.04 kft	225	50ft
102338		!	4.2 kft	225	cloud top
102427		!	3.3 kft	229	cloud base
102928	103017	Profile 3	-.04 - 0.36 kft	222	50ft 500ft
103017	103351	Run 1	0.36 kft	219	500ft point Alpha
103352	104453	Run 2.1	0.36 - 0.46 kft	240	point Alpha
103624		heimann	0.38 kft	266	cal 10
103633		bbr	0.42 kft	266	retract
104453	104708	Profile 4	0.46 - 2.8 kft	267	
104708	105900	Run 2.2	2.8 - 2.4 kft	267	
104749		r2.2	2.7 kft	263	drop to 2500 to clear cloud base
104818		r2.2	2.4 kft	269	restarted 2500ft
105900	110000	Profile 5	2.4 - 3.4 kft	265	
110001	111051	Run 2.3	3.4 kft	264	
111051	111245	Profile 6	3.4 - 5.5 kft	264	
111245	112036	Profile 7	5.5 - -.07 kft	267	50ft
111347		JW	4.8 kft	267	zero
111402		nev	4.4 kft	268	zero
111940		qnh	0.25 kft	266	1019
112037	112116	Profile 8	-.07 - 0.29 kft	268	50ft 500ft
112116	113207	Run 3.1	0.29 - 0.31 kft	265	500ft
113208	113416	Profile 9	0.31 - 1.8 kft	266	
113417	114515	Run 3.2	1.8 - 1.9 kft	267	
114515	114707	Profile 10	1.9 - 3.8 kft	268	
114707	115749	Run 3.3	3.8 kft	263	
115750	120002	Profile 11	3.8 - 5.7 kft	263	reversal 5900
120002	120712	Profile 12	5.7 - -.13 kft	268	reversal 5900
120431		qnh	1.5 kft	271	1020
120712	120747	Profile 13	-.13 - 0.26 kft	269	
120747	121832	Run 4.1	0.26 - 0.36 kft	268	
121833	122153	Profile 14	0.36 - 3.7 kft	265	
122154	123312	Run 4.2	3.8 - 2.8 kft	267	
122237		r42	3.6 kft	267	drop 700ft to remain below inversion
122311		r4.2	2.9 kft	264	restated at 3000'
122407		r4.2	2.9 kft	264	'cloud run' but mostly clear air
122608		r4.2	2.8 kft	279	turning eastwards
122810		!	2.9 kft	027	79 56 most westerly point
123313	124616	Profile 15	2.8 - 14.3 kft	105	
124616	130119	Profile 16	14.3 - -.12 kft	081	
125557		cloud	4.4 kft	089	top
125653		cloud	3.4 kft	092	bottom
130120	130158	Profile 17	-.12 - 0.28 kft	088	
130159	131256	Run 5.1	0.28 - 0.30 kft	084	
130255		r 5.1	0.30 kft	090	500ft
131257	131423	Profile 18	0.30 - 1.6 kft	086	

131423	132526	Run 5.2	1.6 - 1.3 kft	085	
131442		r 5.2	1.3 kft	085	pop down to clear cloud
131452		r 5.2	1.3 kft	084	start
131539		r 5.2	1.3 kft	082	below cloud run 1500ft
132526	132806	Profile 19	1.3 - 3.7 kft	088	
132807	133810	Run 5.3	3.7 - 3.6 kft	091	
132832		r5.3	3.7 kft	092	in cloud run
133811	134030	Profile 20	3.6 - 5.6 kft	083	
133921		cloud	4.7 kft	085	tops
134031	134212	Profile 21	5.6 - 4.1 kft	091	
134212	135359	Run 5.4	4.1 - 5.3 kft	090	
134810		r 5.4	4.1 kft	086	overhead Ron Brown
135400	135418	Profile 22	5.3 - 5.5 kft	096	
135418	140217	Profile 23	5.5 - -.10 kft	098	50ft
135511		!	4.7 kft	097	end 5.4 start p22 late log
135534		cloud	4.3 kft	099	top
135841		qnh	1.4 kft	102	1019
140218	140246	Profile 24	-.12 - 0.27 kft	101	50ft
140247	141340	Run 6.1	0.27 - 0.36 kft	100	
140331		r 6.1	0.37 kft	104	500ft
141340	141610	Profile 25	0.36 - 2.7 kft	101	
141610	142640	Run 6.2	2.7 kft	098	
141642		r 6.2	2.8 kft	099	below cloud
142641	142826	Profile 26	2.7 - 3.7 kft	099	
142826	143925	Run 6.3	3.7 kft	102	
142914		r 6.3	3.7 kft	089	3800ft in cloud
143456		!	3.6 kft	060	point Alpha
143925	144039	Profile 27	3.7 - 5.0 kft	049	
144039	144702	Profile 28	5.0 - -.05 kft	045	50 ft
144208		cloud	3.8 kft	047	tops 4200
144703	144731	Profile 29	-.06 - 0.29 kft	050	50 ft
144732	145731	Run 7.1	0.29 - 0.38 kft	048	
144838		r 7.1	0.36 kft	048	500ft
145732	145949	Profile 30	0.38 - 3.5 kft	046	
150019	150956	Run 7.2	3.5 kft	045	
151613		Land	0.04 kft	019	Arica
151814		ASP	0.08 kft	200	closed

B410 Track 29-OCT-08



SCAR -> SCDA - Overview
NavData Cycle 2008-10 Expired: Thursday, 23 October 2008.
Scale: 1:3410780 (1 inch = 46.78 naut mi). Printed on 28 Oct 2008

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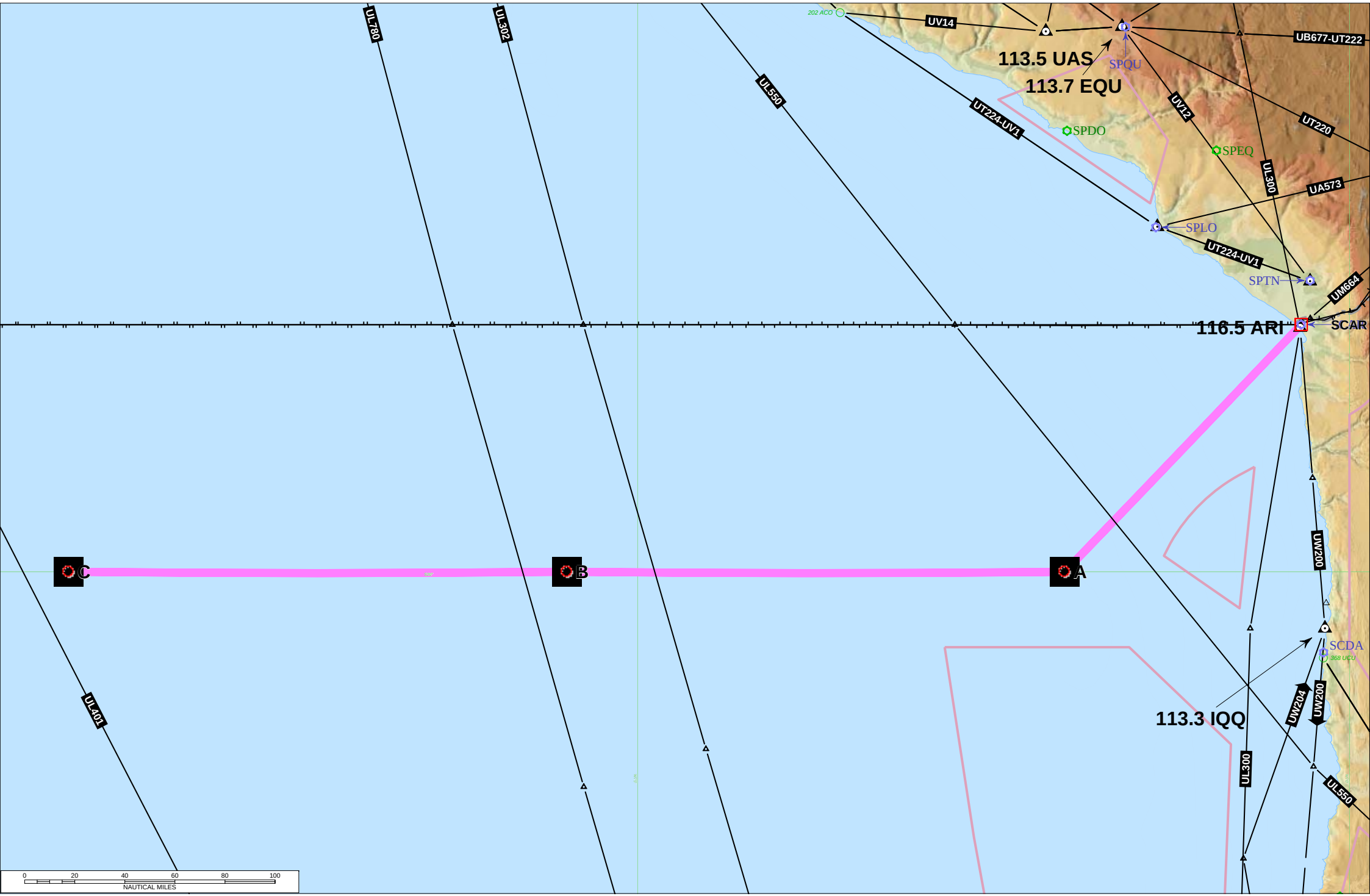


VOCALS Flight B410 **Weds 29 October, 2008**
FAAM sortie brief

T/O **07:00 local**
Land **c. 12:00 local**

Operating Area: South East Pacific Ocean, off the west coast of northern Chile, along latitude line 20S

Point Alpha: 72ºW 20ºS
Point Beta: 79º30'W 20ºS

Sortie Objectives: To sample aerosol and Sc cloud as a function of distance from the coast to the pristine background

Weather: High pressure system off shore capping a marine boundary layer with widespread Sc cloud. Near shore marine boundary layer winds from SSW.

Flight patterns:

1. Take off and profile ascent 1000 ft/min immediately to 6,000 ft amsl to check instrumentation. At Mission Scientist discretion, continue profile ascent to FL100 before profile descending to 50' at 1000 ft/min
[25 min; T=0h 25 min]
2. Continue to point **Alpha** either in cloud or below cloud at 500 ft
[0 min; T=0h 25 min]

3. On westerly heading, profile ascent to 1000ft above cloud top.

4. Perform cycle consisting of

    a. profile descent to 50ft amsl,
    b. climb to 500ft below cloudbase,
    c. 10-min straight/level leg,
    d. climb to 500ft below cloud top,
    e. 10-min straight/level leg,
    f. profile ascent to 1000ft above cloud top.
    g. At Mission Scientist discretion, an additional 10 min leg may be included in this cycle at 100ft amsl.

5. Repeat item 4 until arrival at point Beta, at which point turn onto easterly heading.

6. Following completion of one cycle, at Mission Scientist discretion, profile ascent to FL150 followed by profile descent to 50ft amsl, and then resume cycles of straight/level legs as per item 4.

7. Repeat item 4 along return leg to point Alpha, and continue as far as possible along recovery leg from point Alpha to Arica.

VOCALS Flight B410 (20ºS Cross Section Flight #2) (29/10/2008) Mission Scientist Debrief : Keith N Bower

Mission summary

Take off from Arica at 10.00z was followed by an immediate profile ascent at 1000ft/min (to FL100) on track towards point Alpha (20S 72W). After a short straight and level run (SLR) in transit towards alpha (FL100) a profile descent to 50ft (at 1000ft/min to 1000ft thereafter 500ft/min to 50ft) was undertaken and followed by an immediate climb back to 500ft amsl to start SLR R1 to point Alpha. At Alpha the aircraft turned to head west continuing at 500ft amsl along 20S to carry out a 10min SLR R2.1, which was then followed by SLR R2.2 in clear air below CB, initially at 2800ft. It was clear that there was much more inhomogeneity in the cloud compared to the previous 20S mission (B408), with bases of Cu extending down below the background SCu bases. This classic decoupling became even more pronounced to the west. To enable CVI flow calibrations to be made in clear air, the altitude of R2.2 was reduced by 400ft to avoid the Cu bases. However the calibration was affected by the presence of drizzle drops which increased in concentration through the run. A 10min SLR, R2.3 was carried out in cloud at 3500ft. Drizzle concentrations here were reported to increase to 30 per litre (from 10). Curiously the SMPS on the CVI reported a peak in the size distribution at around 20nm whereas below cloud there were many more aerosols which peaked at 200-300nm in the accumulation mode. Cloud droplet concentrations were reported to be 150-200 per cc (mean diameter 17um) by CDP, 125-150 per cc by FSSP (mean dia 14-15um) but in higher concentrations (300-350 per cc) by the CAS in CAPS (mean dia 13-15um). CAPS liquid water content (LWC) was reported as high as 0.3-0.5 g/m3, while the Lyman Alpha hygrometer on the CVI reported a value of 0.15 g/m3. J-W LWC values appeared to be higher (at least 50% in one spot check). It was considered the presence of drizzle may have caused the CVI flows to have been set too high, possibly missing some of the smaller drops. The CVI enrichment factor of 25 was also lower than on previous flights and so the flows used on previous flights were then adopted for the remainder of the flight. NOx values peaked below CB at 7ppb. Following R2.3 a profile ascent up to 1000ft above CT was carried out. CT was seen to be around 4600ft.

The cycle of profiling down from 1000ft above CT to 50ft amsl, followed by a series of 10 min SLRs at 500ft amsl, at another level 300-500ft below CB and in-cloud 300-500ft below CT (SLRs separated by profile ascents/descents) was repeated (with variations) twice more on the outbound leg and 3 times on the return leg from the most westerly point Bravo (which was 20S 79deg57minW). Upon turning at Bravo, a profile ascent up to FL150 was carried out to investigate the presence of any layering above the level of CT, however little layering structure was seen above the inversion.

The decoupling and corresponding in-homogeneity in cloud structure sometimes made it difficult to estimate Sc CB. However, the observation from previous flights that the whole cloud deck lifted the further west traveled was again seen. CT height increased from ~4300ft (cycle 1 and 2) to 4600ft cycle 3. CBs were around 3000ft closer to the coast increasing to around 4000ft towards Bravo. However beyond 78deg30min W a

cloud free rift like structure was encountered up to the turn. Aerosol size distributions were seen to be bimodal in this zone (peaks at 45nm and >150nm) while PCASP concentrations fell from the 200/cc seen in the first cycle to around 50 -55 (cycles 2 and 4) to around 40 per cc near Bravo. Similarly the cloud droplet concentration of 150-200 observed in cycle 1 dropped to below 70/cc in cycle 4. The rift like region at 80W and beyond was particularly clean with low aerosol numbers together with a reduction in sulphate loading as seen by AMS and VACC. The latter saw little sodium chloride at any time. 2DC drizzle concentrations were observed to be a lot higher in the last but one cycle 5. These were higher than 100 per litre during incloud run R5.3. Finally during the final cycle (after passing ALPHA) before landing, substantial increases in mass loadings and aerosol numbers were observed. Sub and supermicron aerosol (SMPS and CAS) concentrations increased by at a factor of 3, CCN concentrations increased by >30% and a corresponding 8ppb decrease in O3 concentration was observed. At the same time the cloud layer thinned to around ~500-600ft deep. The aircraft landed at Arica at 15:16z

Instrumentation

CVI : zeros below cloud (ie flows set to lead to zero aerosol concentration in the absence of coud droplets) were troublesome due to the presence of drizzle, while zeros above cloud were good. Still no CPC on the CVI. Flows for previous flights used.
Wet-Neph : mostly OK, but brief period of lost data (due to comms error)
SWS/ARIES/MARSS : good throughout
SHIM : upper OK lower not working
AMS : fine
SMPS : OK up to a certain alititude
Core chemistry ; CO NOx SO2 Ozone all fine
CCN : no data on outbound leg (leak from cabin) but fine on return leg
Water CPC : fine throughout flight
VACC : perfect
Cloud microphysics:
PCASP : seems to need a clean. Extra counts seen in channel 1 needs investigating further
Backup FSSP and CDP swapped over which was seeing the higher concentration but generally these and other microphysical probes were OK
PCIP-15 (known faulty before takeoff)
LWC JW and Nevzorov : good throughout.
2DS : fine
CAPS : fine

Mission Scientist's Log

Flight No B.440.. **Date** 29/10/08.... **Name** K.N.BOWER **Page** 1 **of** 10

Time (GMT)	Run / Profile	Height	Hdg	GPS Position	Remarks / Observations (cloud type & amount in oktas, weather, visibility, winds, sea state etc.) eg Cirrus 2/8, StratoCu 3/8, hazy, wind 240°/24kts
6.45:37 (KNB)	—	6:47.54			Stations 1 — 4
6.52.04 (KNB time - noted)					Pwr transfer
6.54.04					Twci
6.59.24					Rolling
7.00.00	≡	09 59 43 Z			T/O
					CB, — Very Grey! 2850 ft.
					1013
					CT — 3500 ft
09.59.43	P1				5m T/O
10.10.09	P1 end	FL100	220	18°48/70°48	SLR transit before start of profile down-to
					Wet Neph — enable instruments/operators to set up.
					AMS seeing substrate already.
10.18.02	P2 start	FL100	225	19°12'/71°12'	Profile down to 50ft towards ∝ 10.3°/21.7°C
					697mb 1m/s/208°
10.23.42	P2	4000	224	19°30'/71°30'	CT 4300 ft 872mb, 7.68/-17.67
10.24.29	P2	3200	229	19°30'/71°30'	CB 3300 ft
					QNH 1017 hPa
					Neph ⇒ large 7500 - 6000
10.29.27	P2/P3	50ft	222	19°48'/71°42'	16.8°C/10.68°C 1014mb 5m/s/201°
10.30.14	R1.0 St	500 ft	219	19°48'/71°48'	End P3 - Start SLR 15.6°/9.64°C 1001mb
					P CASE 200, ~ 20-25 ↑ CT
					Seeing 3 yaghts 80m — Aer Monte 300m
10.33.52	R2.1	500 ft	turn.	∝	End R1, turned to start R2.1 -
					QNH 1018

Mission Scientist's Log

Flight No B.410 **Date** 29/10/08 **Name** K. N. Bower

Time (GMT)	Run / Profile	Height	Hdg	GPS Position	Remarks / Observations (cloud type & amount in oktas, weather, visibility, winds, sea state etc.) eg Cirrus 2/8, StratoCu 3/8, hazy, wind 240°/24kts
~~10:49:30~~					CAS ~ 7/cm³ ↑ 0.6μm
					(but nothing > 3μm)
					- looking up - some inhomogeneities in cloud
10:44:52	R2.1E/P4	5000ft	267	20°0/72°42'	996mb 14.85°/10.08° 8m/s/173°
10:47:00	P4E/R2.2	2800	267	20°0'/72°48'	Starting run - in CBs - dropping down
					but SO_4 - not seeing NaCl.
10:48:17	R2.2	2400	269	20°0/72°54'	Restarted run at 2500ft to clear Cu CB - for CN cal
			(926mb	8.61°/8.05°C)	CCN - double dump CCN
			(5m/s	160°)	CPC - CN ≈ 300-330 cm⁻³
					CCN ~ 5
					MBi 3 -
					CN seem draggle - so Plume to high
					because of this - zero particle flow will have drops
10.58.57	end 2.2/start P5	265		20°0/73°42'	927mb 8.61°/8.45°C 7m/s/159°
					CB at 300
10.51.51	end P5/R2.3 Start	3500	266	20°0/73°42'	In cloud 895mb 6.22/7.63°C 7m/s/152°
					higher drizzle 10/l → 30/l. here
					NOx 7ppb - just below ~~CT~~ CT
					CVI enrichment to 25
					AMS - on CVI scales peak at 20nm
					nano mode below CB - large stuff
					centred at 300nm -

Mission Scientist's Log

Flight No B. 410 **Date** 29/10/08 **Name** K.N. BOWER **Page** 3 **of** 10

Time (GMT)	Run / Profile	Height	Hdg	GPS Position	Remarks / Observations (cloud type & amount in oktas, weather, visibility, winds, sea state etc.) eg Cirrus 2/8, StratoCu 3/8, hazy, wind 240°/24kts
					ODP 150 – 200 Ø 17μm
					FSSP 125 – 150 Ø 15–14μm
					CAS – 13–15μm concs 300–350cm⁻³
					not sure bt of .....
					LWC 0.5 g/m (0.3–0.5 g/m³)
					ONT LWC 0.13 or 0.125
					JW screwdriver (started – but seems higher to me)
11.10.49	2.3 and/P6	3400	265	20°0/74°30	894mb 6.5°/9.1°C 10m/s/157°
11.11.50	P6	4400	260	20°0/74°36'	4600' = CT 881mb 3.89°/7.36° 9m/s/147°
~~11.11.50~~	~~P6~~	~~4600ft~~			~~CT~~ Climbing to 10000' above CT.
11.12.42	P6/P7 st	~~5400ft~~	267	20°0'/74°30'	P6 and P7 start at 5600ft (Strong T/Td ?) 16.2/23.8°
11.13.56	P7	4600ft	268	20°0/74°42'	CT = 4600' again 15.32°/-25.4° 7m/s/147 856mb
11.15.18	P7	3000ft	261	20°0/74°48	CB = 3100ft 6.71°/8.38° 11m/s/146° 905mb
					NO_x
					Peak just under 2ppb NO_2 above
					(0.5ppb background)
					1019 QNH
11.20.31	P7 end/P8 start	500ft	265	20°0/75°12'	1015 mb 16.47°/10.32° 10m/s/149°
					Descent: large drizzle drops ↑700μm
					PCASP 40–50 cm⁻³
					CN ~ 200
					CCN ~ 10 at 0.2%
11.21.14	P8 and/P8.1	500ft	265	20°0/75.1°	CN / SMPS Conc lower (1003mb 11m/s/152°
					SO_2 lower, VOCs also +15.22/10.86°)

Mission Scientist's Log

Flight No B. 410 **Date** 29/10/08 **Name** KN BOWER **Page** 4 **of** 10

	Time (GMT)	Run / Profile	Height	Hdg	GPS Position	Remarks / Observations (cloud type & amount in oktas, weather, visibility, winds, sea state etc.) eg Cirrus 2/8, StratoCu 3/8, hazy, wind 240°/24kts
						Blip in Nephelometer
	11.26.30	↓				Blip in CPC – doubling concentration
						Blip in VACC also here
						2DS – some drizzle
(500)	11.32.04	R3.1e/P9	[300ft]	265	20°0/76°0	Climbing to do Run at 2600 (from 500ft)
(2000)	11.34.13	P9end/R3.2	1800'	267	20°0/76°12'	CB lower here – so next run at 2000ft
	11.37.13					2DS – some drizzle
						CPC ⇒ 7 drizzle events
	11.44.00					Lot of drizzle here
	11.45.12	R3.2en/P10	1800'	268	20°0/76°54'	946mb 10.69°/11.28°C 10m/s/169°
						Cloud base very variable – inhomogeneous boundary ?
(2000)	11.45.12	R3.2e/P10s	1800'	266	20°0/76°54'	Climbing to do cirbed run
(3900)	11.47.03	P10e/R3.3 slot	3700'	263	20°0/77°6'	883mb 6.23/7.97°C 12m/s/152°
						SP2 – seems particle – not incandescing though
						High mass Org, + Sulphate
						Particle chat – peaks 20nm (old CVI ??) *
						(Vol dust 300nm)
	11.53.23	R3.3	3800	265	19°54/77°30	Hole in cloud here 881mb 5.35/6.76° 12m/s/158°
	11.54.00	R3.3				Local CB is above us – a hole (cored)
						Drop N° – Cmes CDP 150—50 range
(4000)	11.57.47	R3.3E/P11s	3700	264	19°54/77°48'	882mb 6.06°/7.07°C 11m/s/150° P11 starts in a hole
	11.58.56	P11	4600	264	19°54/77°54'	CT @ 4900 ft 856mb 3.88/6.57° 9m/s/140°
(5900)	11.59.58	P11E/P12s	5600	268	20°00/78°0'	821mb 14.35/-26.86 4m/s/116° big change T/Td
(4900)	12.01.20	P12	4600	261	20°0/78°6'	CT. 852mb 5.27°/-15.43° 10m/s/152°
(4000)	12.02.16	P12	3700	263	20°0/78°12'	CB 3600 – 4000 ft 884mb -6.80°/12.31° 10m/s/146°

Mission Scientist's Log

Flight No B.410 **Date** 29/10/08 **Name** K.N. BOWER **Page** 5 **of** 10

Time (GMT)	Run / Profile	Height	Hdg	GPS Position	Remarks / Observations (cloud type & amount in oktas, weather, visibility, winds, sea state etc.) eg Cirrus 2/8, StratoCu 3/8, hazy, wind 240°/24kts
					1020 QNH
					PRB – Classic decoupling ....
					BL decoupling – T structure MSeq2
					Cu below Sc base ....
12.07.08	P12and/P13	[500ft]	268°	20°0/76°30'	12m/s/144° 1017mb 16.9°/11.59°
12.07.44	P13and/R4.1	[500ft]	268	19°54/76°36	11 m/s/141° 1005mb 15.99/11.66
12.16:30	R4.1	[500ft]			Big hole ahead here (rift?)
					No cloud above us at all
					AMS – SMPS – broadly below
					Peaks: at 4pb and >100 nm.
					Cones 'results here
					PCASP = 55
					CN = 280
					CCN = ? Low level Max CCN 0.6% very lt
12 18.33	R4.1and/R4.2	500ft			(Profile b where cloud would have been) 12m/s/147° 1000mb
(3100) 12.21.56	P14and/R4.2S	3700	267	19°54/76°30	Aborted — above blue Inversion 883mb
(3000) 12.23.09	R4.2	2900	264	19°54/76°36'	Restarted run at 3000ft – below inv 911mb 8.71/5.87°
					CCN results – low CCN at 0.6%
					Haze in POC (respected 80% act low
					– now less than 10%
					PCASP – 40 cm^3
					CAS – 4 cm^3
					Uber clean here – Stop
3000 12 23.10	R4.2a/P15	2800	105	19°48/76°36	913mb 8.85/6.0 10m/s/134°
12 25 47	R4.2	2800	263	19°54/76°46'	913mb 9.07/6.2°C 11m/s/146°

79.56

RBC 19° 38.483S – Overpass in Cloud – HC

74° 46.884°W

Mission Scientist's Log

Flight No B.410 **Date** 29/10/08 **Name** K.N. Bower **Page** 6 **of** 10

Time (GMT)	Run / Profile	Height	Hdg	GPS Position	Remarks / Observations (cloud type & amount in oktas, weather, visibility, winds, sea state etc.) eg Cirrus 2/8, StratoCu 3/8, hazy, wind 240°/24kts
12.46.20	P5 end/ P16 start	15000			Not seen much aloft - MSc 2 → high
					Td from previous flight
12.55.39	P16	4900			CT
					NO_x peak, Sx background at CB
					CCN
					PCASP - 55-60 cm^{-3}
12.56.32	P16	3900			CB
13.01.18	P16 end/ P17 st	500ft			...
13.01.56	P17 o/s 1.5	500ft	84	19°48'/77°36	1002mb 15.66/9.6° 8m/s/135°
					MSc 2 - Sea Cu below SCu base
13.11.22					Cirr cloud - Drizzle
					- Drizzle on screen too
(500) 13.11.52	S.1 end/ P16 st	300ft	87	19°48/76°54	CB is very variable - to 2000ft
(800) 13.14.18	P16 end	1500ft	86	19°48/76°48'	Too high to clear CB - drop to (950mb)
(1500) 13.14.40	RS.2 s	1300	85	19°48/76°48	954mb 12.14°C/9.5°C 10m/s/125°
					14 mins N of E-W track. - to avoid RB
					in cloud
13.25.24	S.2 end/ P19	1300	88	19°42'/76°6'	966mb 12.24°/9.63°C 9m/s/140°
13.26.39.					Drizzle - variable CB - Cu tops ~2600
(3400) 13.28.08	P19 end/ RS3	3700	91	19°42/76°0	~~<2000ft~~ too near CT - bumpy.
13.30.10 (13h)	RS.3	3700			Big hole here (not thermal cloud - but NO cloud)
					PACE saw SO_4 - little Sea Salt but
					now below CB.

Mission Scientist's Log

Flight No B. 410 **Date** 29/10/08 **Name** K. N. Bower **Page** 7 **of** 10

Time (GMT)	Run / Profile	Height	Hdg	GPS Position	Remarks / Observations (cloud type & amount in oktas, weather, visibility, winds, sea state etc.) eg Cirrus 2/8, StratoCu 3/8, hazy, wind 240°/24kts
	RS.3				Core Cloud PSSP 50 cm⁻³ Φ = 13
					CDP 70 Φ - 18
					RDC drops drop ones bit higher
					>100/l
					CCN — N's making more smoke. now
					CAS — 250 drops — 20μm
					(not seeing much droplet through)
					LWC = 0.5 g/m³
					(CN = 5.1, @ 0.1% SS 200 CN
13.38.05	RS.3end/P20st	3600	83	19°36'/75°24'	886 mb 6.08°/8.85° 9m/s/119°
13.39.18	P20	4600	86	19°36'/75°18'	CT 4900ft. 855mb 3.66°/6.47° 8m/s/144°
1340.28	P20end/P21	5600	91	19°36'/75°12'	↗ 5900ft 825mb 16.01/-27.68 2m/s/87°
(4900) 13.41.46	P21/	4600	86	19°36'/75°6'	CT ~4900 855mb 5.18°/-21.1°C 6m/s/123°
(4300) 13.42.09	P21end/RS.4	4100	90	19°30/75.6°	4300 870mb 4.9°/-0.42°C 7m/s/131
					Core Cloud — Conc same - CDP always Φ
					higher than PSSP — new reversed. ??
					CN1 LWC 0.29 - about half JW.
					CAS 20μ 400 cm (300-500)
					LWC = 0.6 JW = 0.5 Nev 0.35
13.52.27	~~RS.4 end~~/P22st	4100	104	19°36'/74°30	871mb 4.8°/8.1°C 7m/s/113°
(4700) 13.53.55	P22	4400	104	19°36'/74°30	CT 4700 861mb 4.03/7.72°C 8m/s/127°
(5700) 13.54.06	P22/P23	5400	96	19°36'/74°24'	↗ 5700 828mb 15.56/-29.8 4m/s/46°
(4700) 13.55.16	P23	4600	98	19°36/74°18	CT 4700 855mb 14.72/-34.74°C 6m/s/95°
(2900) 13.57.11	P23	2600	104	19°36/74°12'	CB 2900 916mb 7.93/8.77 7m/s/125°
					QNH 1019

13.48.08 RS.4 4100 86° 19°30'/74°42 871mb 4.87°/8.09° 6m/s/128° Overhead KMB

Mission Scientist's Log

Flight No B.410 **Date** 29/10/08 **Name** K. N. Bower **Page** 8 **of** 10

Time (GMT)	Run / Profile	Height	Hdg	GPS Position	Remarks / Observations (cloud type & amount in oktas, weather, visibility, winds, sea state etc.) eg Cirrus 2/8, StratoCu 3/8, hazy, wind 240°/24kts
					Double CCN counts 60/300 CN here
14.01.20					previous 30/400 at furthest W. point
14.02.15	R23c/R24	7000 ft	101	19°42'/75°54'	1017mb 16.32/10.76°C 5m/s/143°
14.02.44	R6.1st	5000 ft	100	19°42'/73°54'	end P24 1003mb 15.42/10.4°C 6m/s/143°
14.08 ish					CO went up 5ppb or so last minute
					Good clear SO_4 transition no organics
					(VACE) – little sea salt.
					PCASP – 110
					AMS – SMPS not much <100 nm
					mode · 200–300 nm peak
					CCN advanced back 4 → crash
(2900) 14.16.08	P25i/R6.2s	2600ft	99°	19°48'/75°6'	below CB (main) – in Cu bases at time
					Drizzle – 100μm width – 0.2/cm³
					Cirr Cloud 10/litre 200μm
					CB is above – but we are in hole.
					Cirr Cloud FSSP – indicates some late cloud
					Lots of SO_4 here –
					staying here at this alt
					– dipping down to avoid Cu bases – back up now
(2900) 14.26.38	R62c/P26	2900	99°	19°54'/72°30	– In cloud on P26 at 14.27.12 (3200ft)
14.28.23	R6.3s	3800			In Cloud run – P26end (dropped down from 4300 to be in cloud)
					FSSP = 150 Φ=13 CDP=200 Φ=17μm
					60/litre 200
					2DS – CAS 350-400 13μm LWC 0.3
					CAS drop → 1000

Mission Scientist's Log

Flight No B. 410 **Date** 29/10/08 **Name** K. N. BOWER **Page** 9 **of** 10

Time (GMT)	Run / Profile	Height	Hdg	GPS Position	Remarks / Observations (cloud type & amount in oktas, weather, visibility, winds, sea state etc.) eg Cirrus 2/8, StratoCu 3/8, hazy, wind 240°/24kts
(3800) 14.34.50	R6.3	3600	73°	19°84'/72°0'	Turn at ∝ – dad is thro here
					– can see through bases at this end
					v. bright above
(3800) 14.39.22	R6.3end/P27st	3600	49°	19°96'/71°42'	ARRIVED
14.42.51		3900			4200 ft
14.42.		3500			
(4200) 14.39.43	P27	3900	47°	19°96'/71.42	CT 4260 875mb 5.9°C/7.19°C 3m/s/346°
14 40 36	P27/end/P28st	3900	45°	19°42/71°42'	5200 ft, start P28 ↓ 17.95/25.21°C 4m/s/335
(4200) 14.41.51	P28	3900	44°	19°42/71°36	CT 4200ft. 878mb 12.28/-33.56°C 4m/s/345°
(3600) 14.42.34	P28	3300	44°	19°36'/71.36	CB 3600ft 897mb 8.0/4.87°C 3m/s/2
3700 14.47.01	P28/end. R7.1st 500ft	500ft	50	19°30/71°24'	End P28, start P29 up to 500 ft
14.47.01	R7.1st	500	48	19°24/71°24'	1002mb 16.46/10.94°C 2m/s/168°
					CN counts ↑ 3x
					Lwc (CAS) aerosol ↑ 3x
14.57.30	R7.1end/P30	500			big step change in ae measurements here:
					CCN ↑ by 1/3 -
14.59.21	P30	2600	47	19°0/70°54'	CB 913mb 9.98°/9.71° 0/245°
					Interrupt in PCASP
					drop d Gprob in O3 in last 10 minutes
					maritime Aerosol
(3600) 14.59.49	P30end/R7.2st	3500ft	42	19°0/70°48'	At CT – dropping down to be in cloud
	R7.2.	3400			around 100 ft to be in cloud
					easing down into cloud after base is CT
					2000 ft.
	R7.2end	3300			

Mission Scientist's Log

Flight No B410 **Date** 29/10/08 **Name** K.N. Bower **Page** 10 **of** 10

Time (GMT)	Run / Profile	Height	Hdg	GPS Position	Remarks / Observations (cloud type & amount in oktas, weather, visibility, winds, sea state etc.) eg Cirrus 2/8, StratoCu 3/8, hazy, wind 240°/24kts
12.15.31	KNB trn				Landed
12.20.44	KNB trn				Parked

7/0 6.10 Heat. tomorrow

CVI – zero below cloud troubleshoot – dry zero
above cloud good zeros – still no CPC.
(No CPC – pull back on)

Wd Neck – works OK – bonet round last one.

Aldes – no

SWS – OK

Scanns – still not working

AMS – fine

SMPS – OK up to attain altitude (Can't work at 10,000ft)

Core Chem – all fine CO
SO_2
NO_3
O_3

Core Cloud PCASP – needs a clean
– extra counts in ch 1 – doesn't look right
– maybe a particle
– moved when FSSP run CDP – swapped over syring
no hard disk crashes

Ants OK.

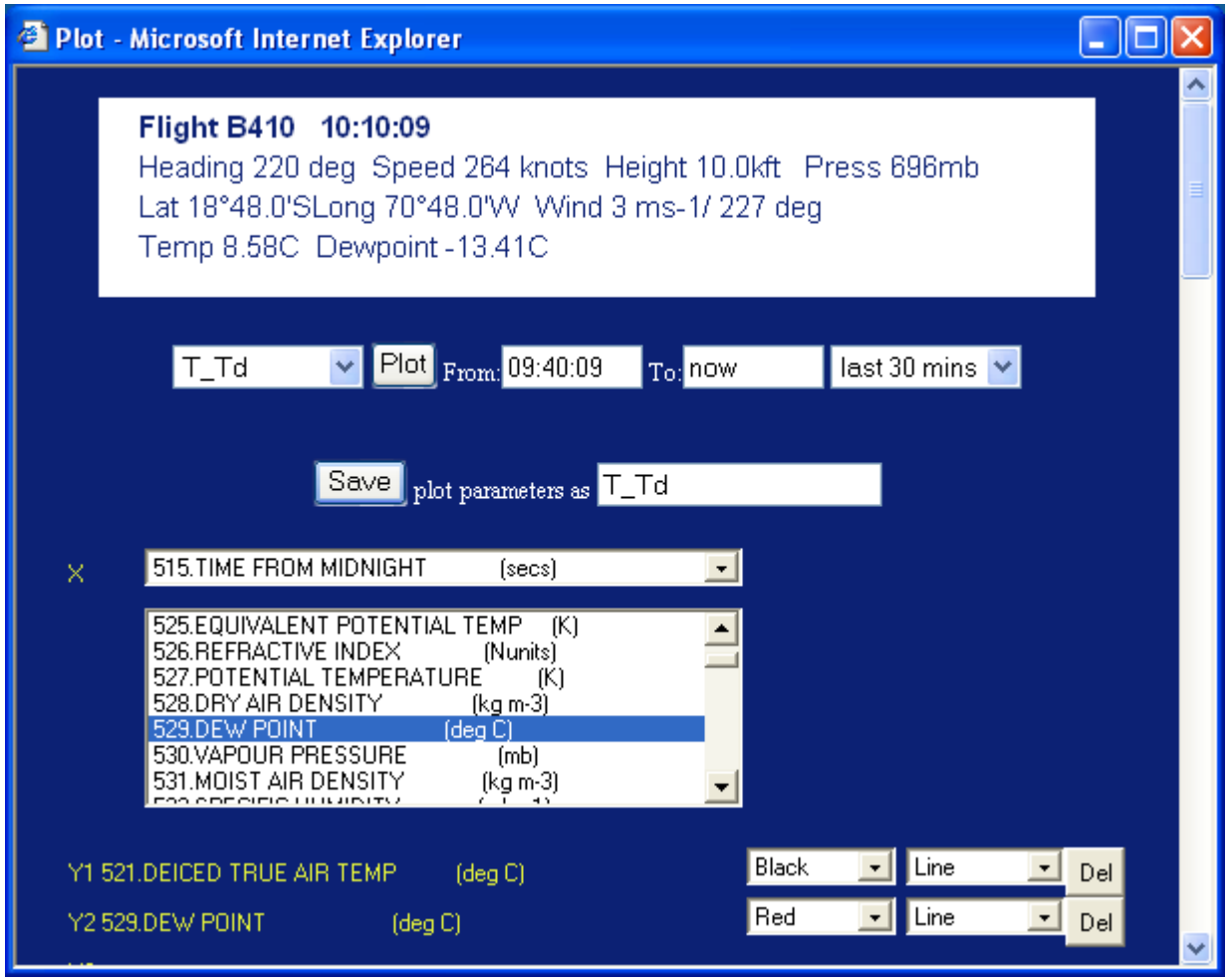
Mons OK

CCN – 1st half flight – sampled ambient air 1st half
WCPC Run whole flights. all of 2nd half OK.

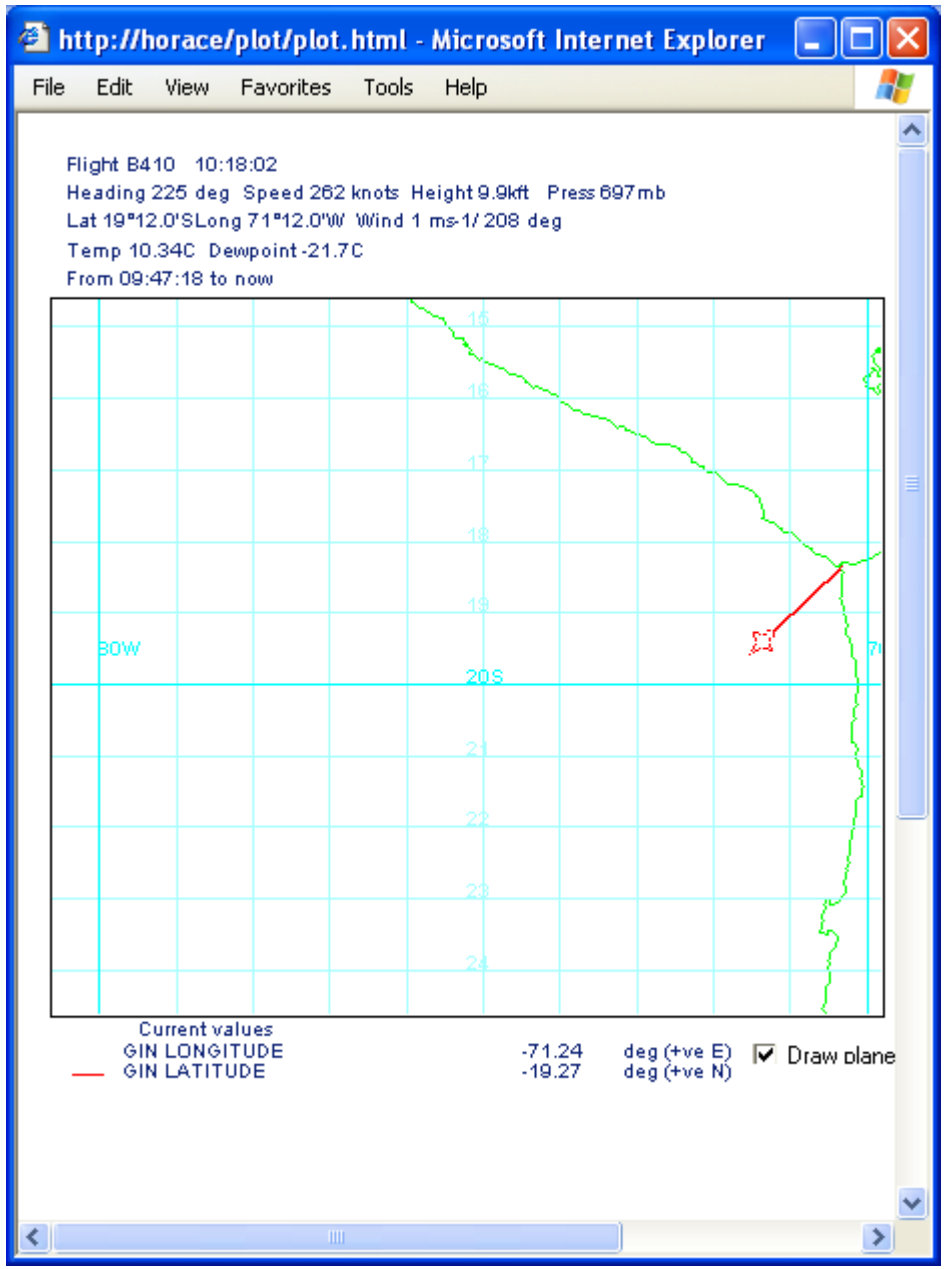
VOCC – perfect

2DS – fine

CAPS – fine


Plot - Microsoft Internet Explorer
Flight B410 10:10:09
Heading 220 deg Speed 264 knots Height 10.0kft Press 696mb
Lat 18°48.0'SLong 70°48.0'W Wind 3 ms-1/ 227 deg
Temp 8.58C Dewpoint -13.41C
T_Td
Plot
From: 09:40:09
To: now
last 30 mins
Save
plot parameters as
T_Td
X
515.TIME FROM MIDNIGHT (secs)
525.EQUIVALENT POTENTIAL TEMP (K)
526.REFRACTIVE INDEX (Nunits)
527.POTENTIAL TEMPERATURE (K)
528.DRY AIR DENSITY (kg m-3)
529.DEW POINT (deg C)
530.VAPOUR PRESSURE (mb)
531.MOIST AIR DENSITY (kg m-3)
Y1 521.DEICED TRUE AIR TEMP (deg C)
Y2 529.DEW POINT (deg C)
Black
Line
Del
Red
Line
Del

End P1

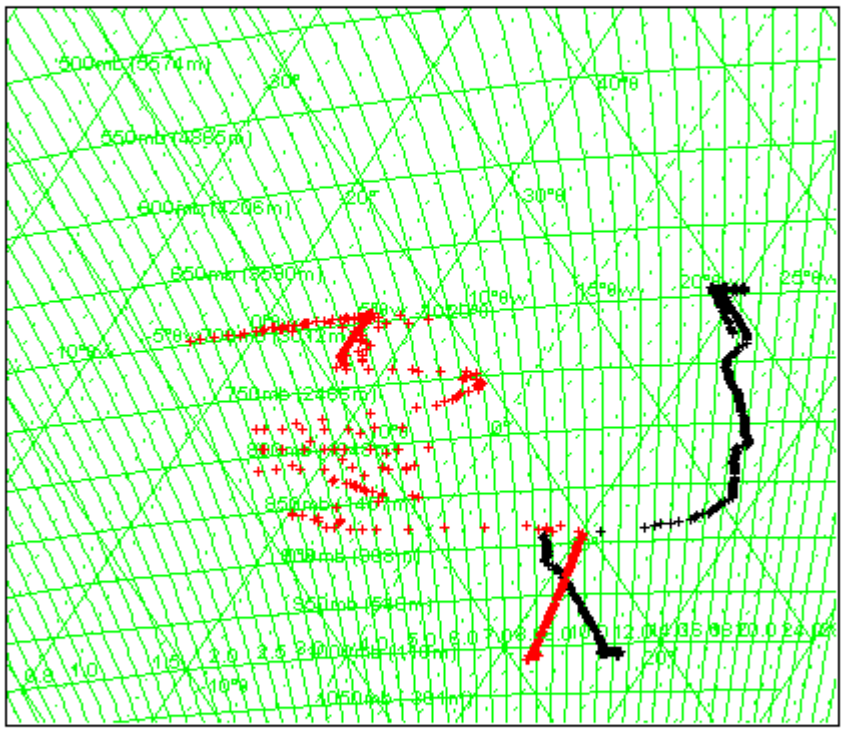


P2 start FL100 - 50ft

http://horace/plot/plot.html - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Flight B410 10:19:11
Heading 225 deg Speed 256 knots Height 8.8kft Press 729mb
Lat 19°18.0'S Long 71°12.0'W Wind 1 ms-1/ 291 deg
Temp 11.44C Dewpoint -11.88C
From 09:49:01 to now



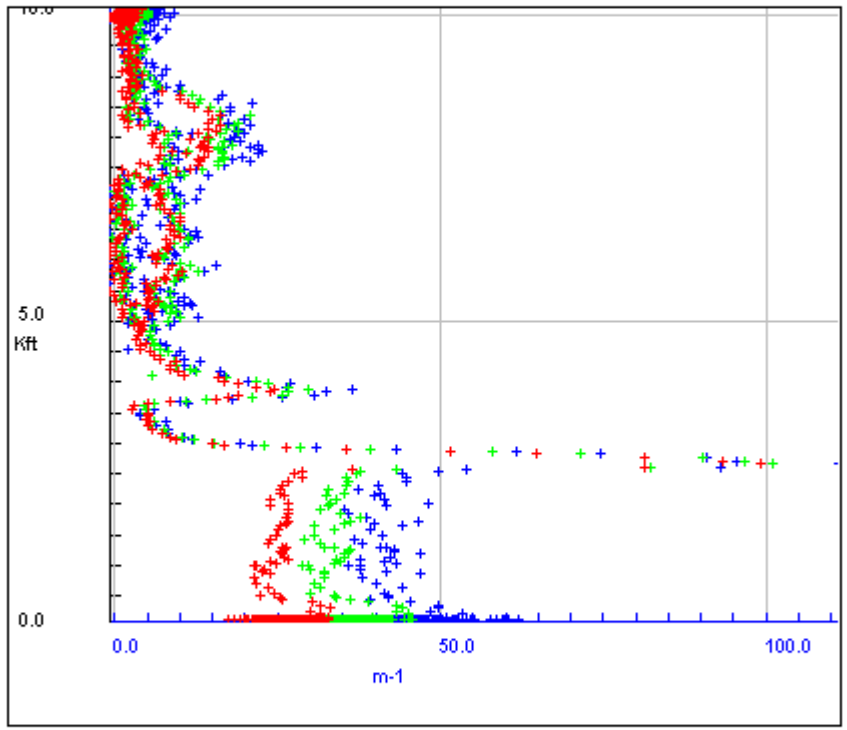
Current values

	STATIC PRESSURE	729.31	mb
++++	DEICED TRUE AIR TEMP	11.45	deg C
++++	DEW POINT	-11.89	deg C

http://horace/plot/plot.html - Microsoft Internet Explorer

File Edit View Favorites Tools Help

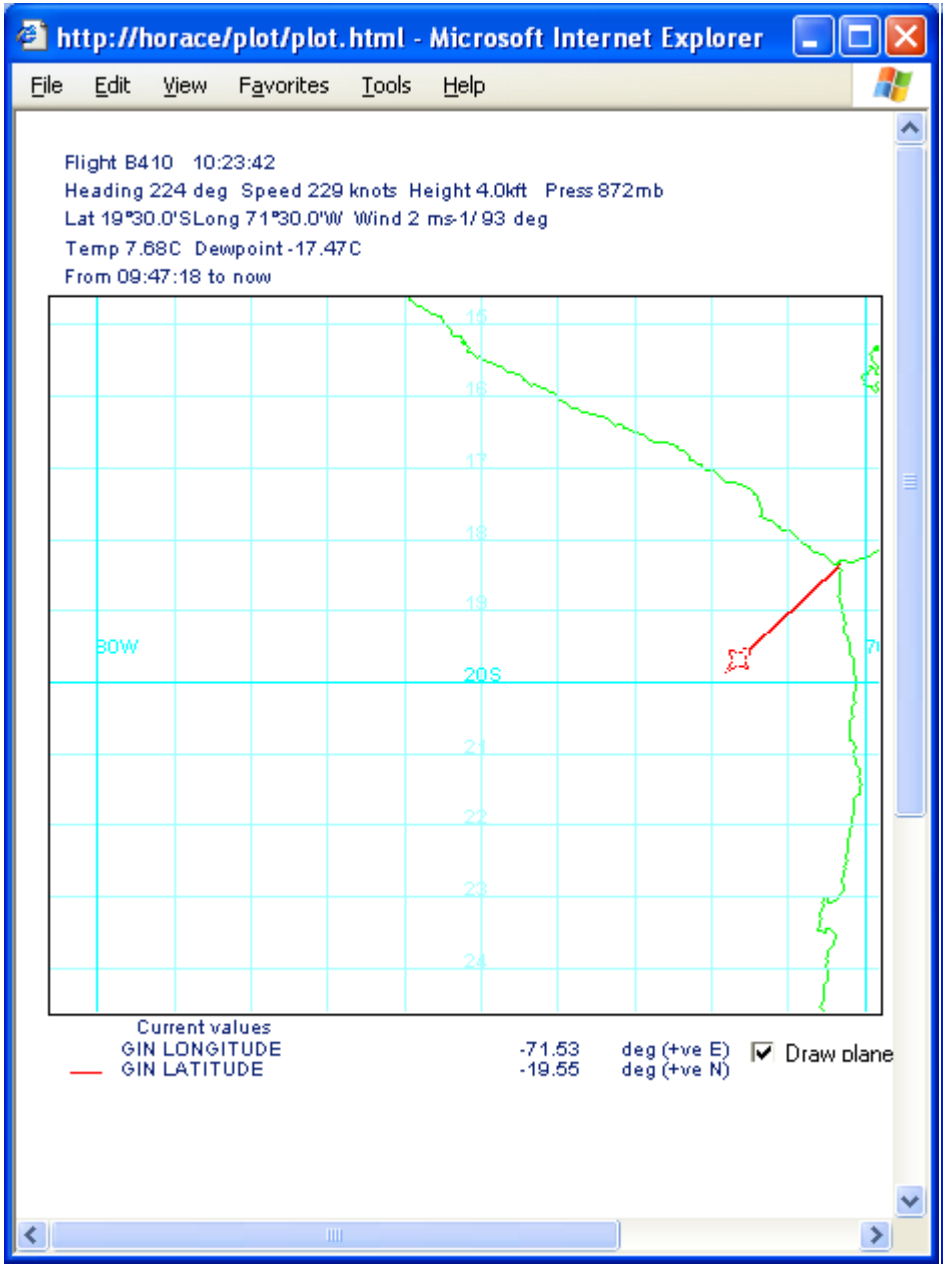
Flight B410 10:22:55
Heading 224 deg Speed 240 knots Height 4.9kft Press 845mb
Lat 19°30.0'S Long 71°24.0'W Wind 3 ms-1/ 269 deg
Temp 19.15C Dewpoint -25.11C
From 09:52:41 to now

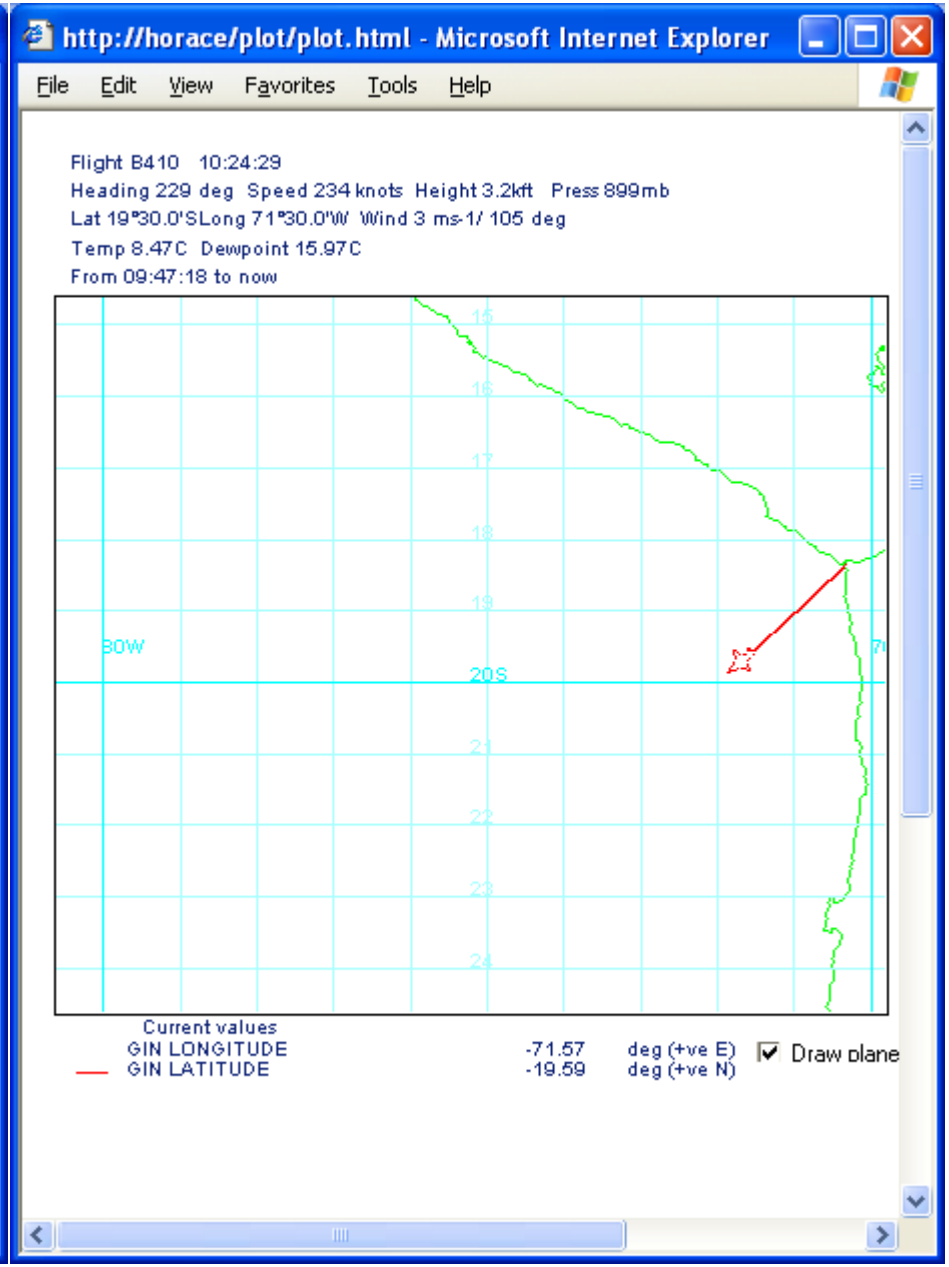


Current values

	PRESSURE HEIGHT	4.92	Kft	
++++	NEPH BLUE SP	5.61	m-1	
++++	NEPH GREEN SP	5.99	m-1	
++++	NEPH RED SP	2.81	m-1	

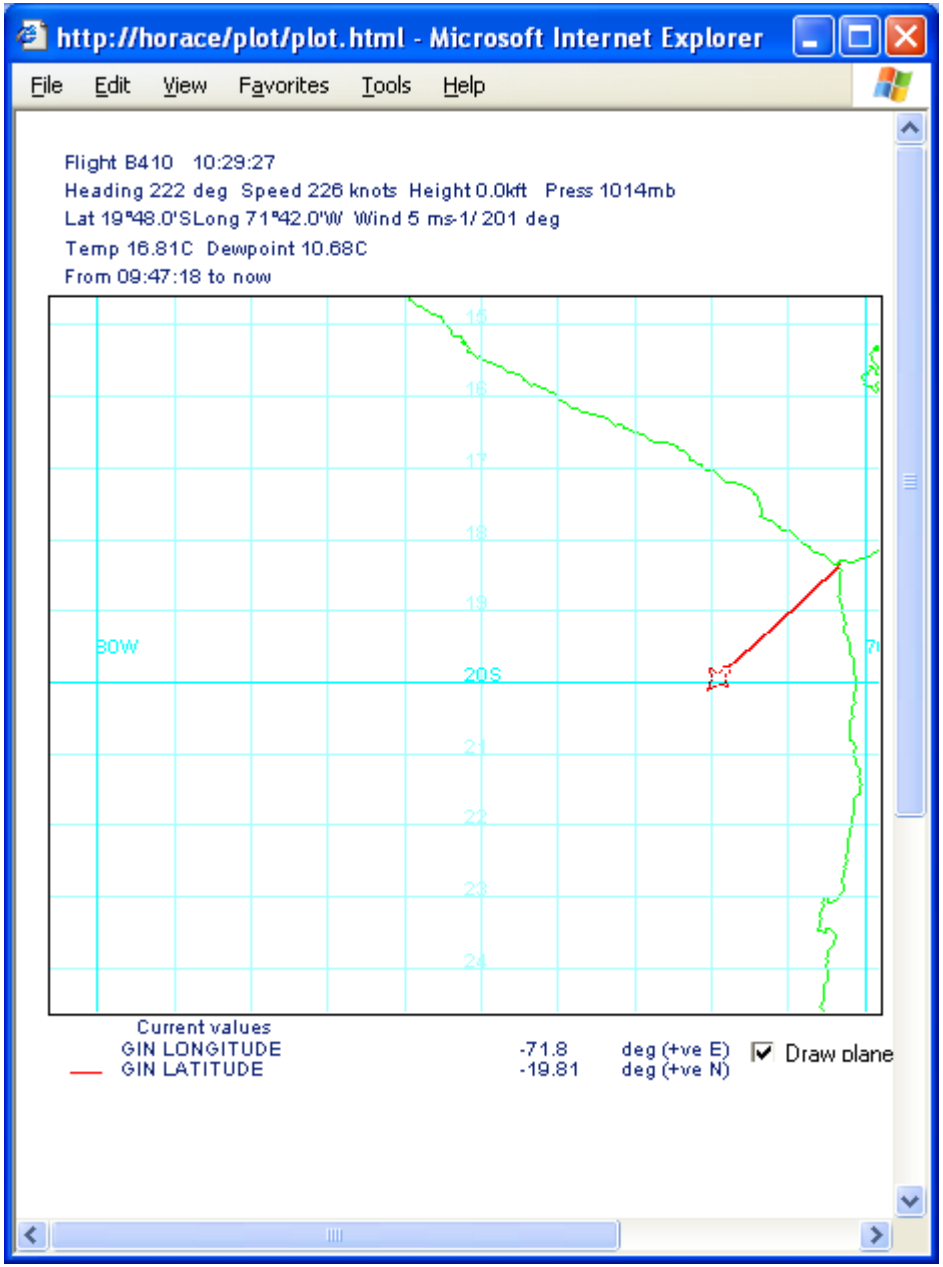
(•) All

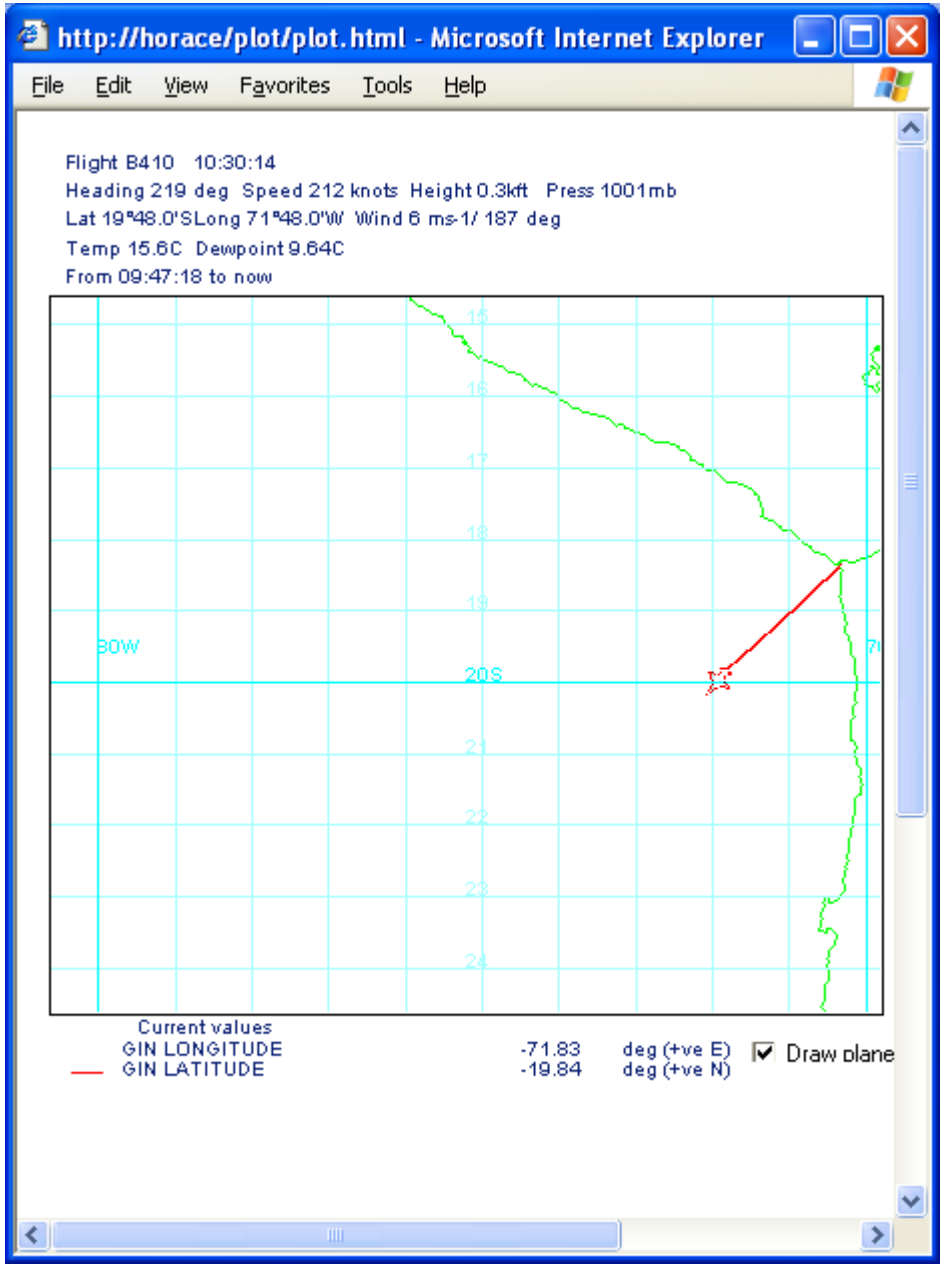




CT 4300ft

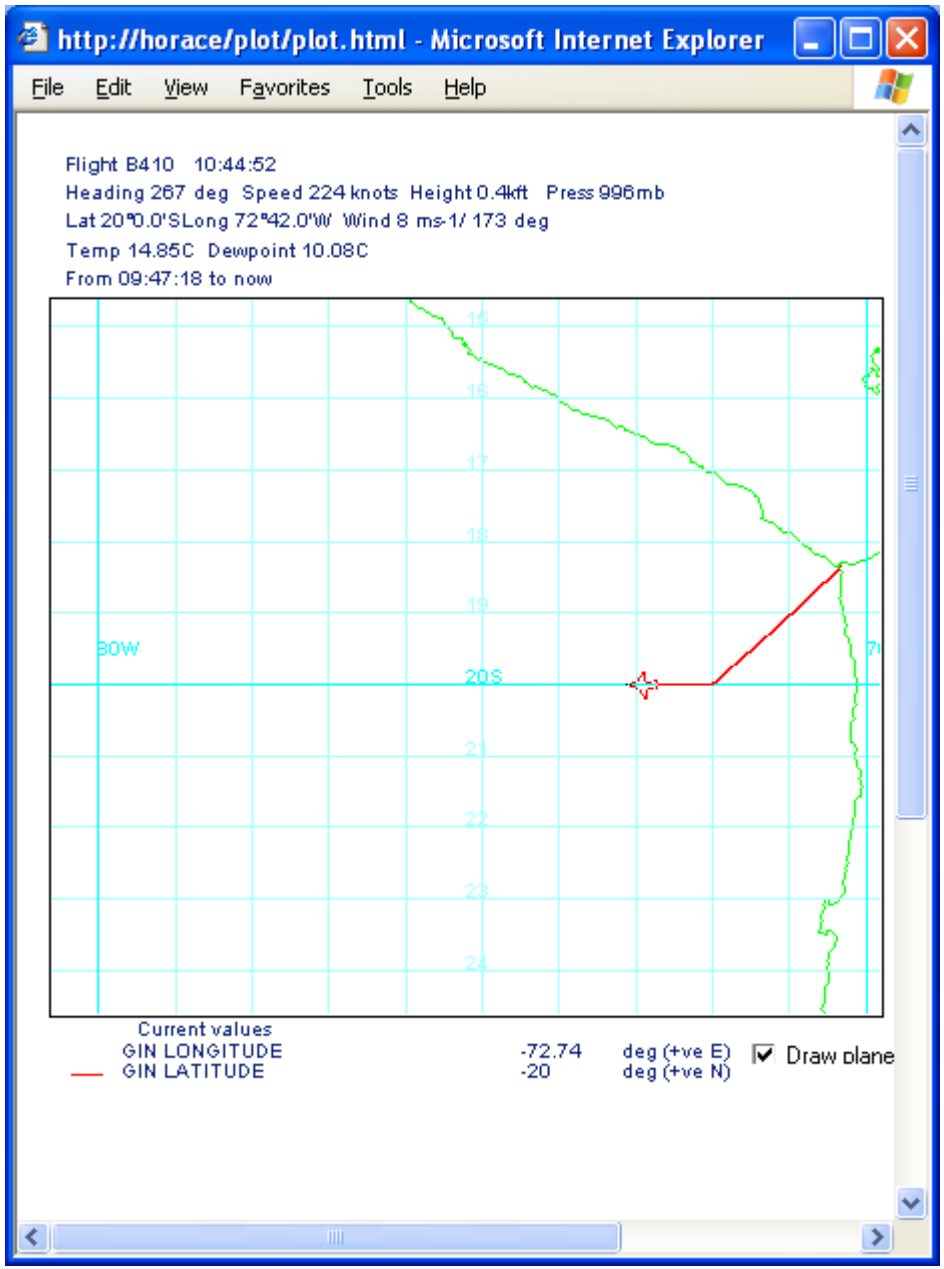
CB 3300ft

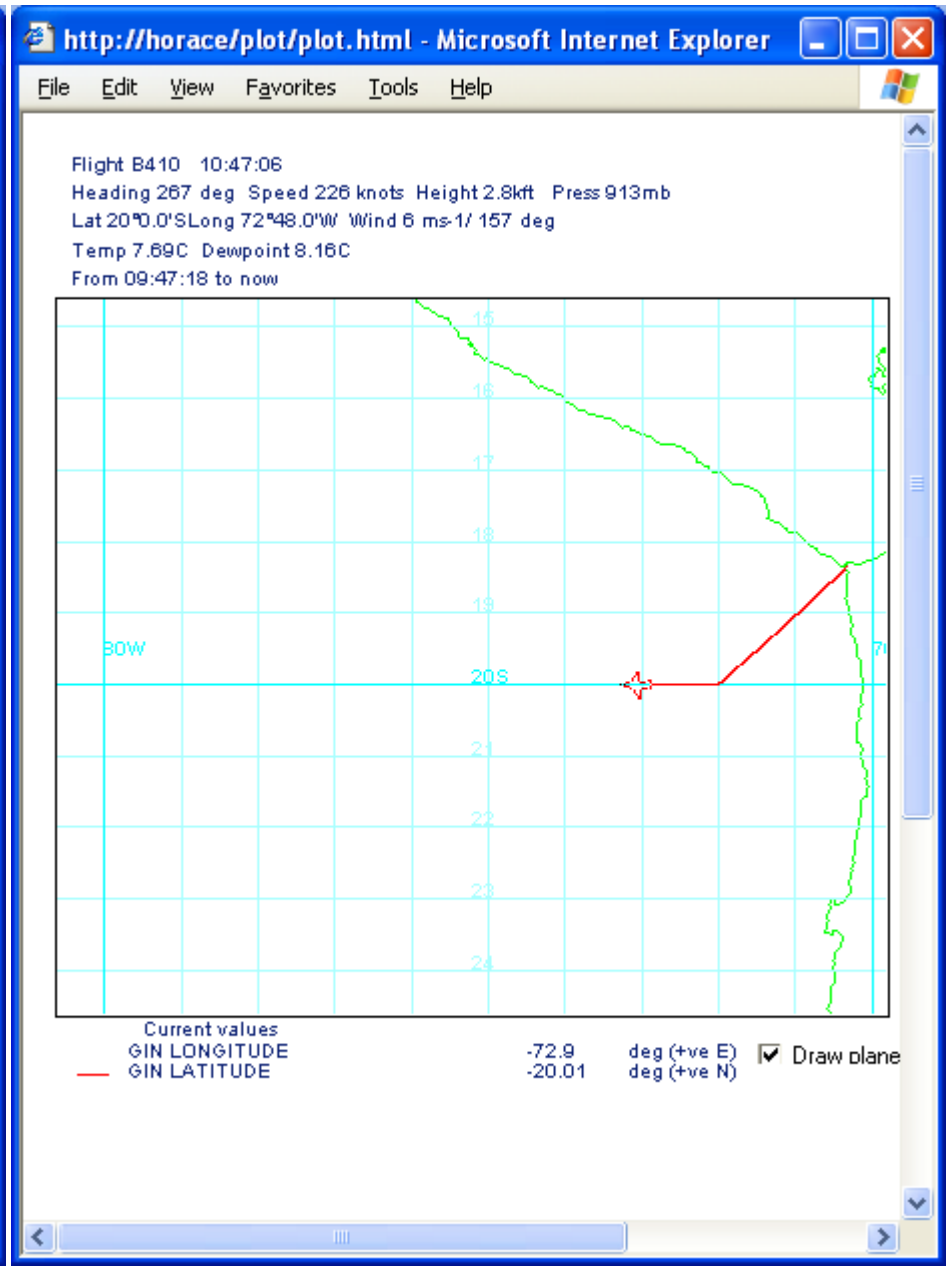




P2 end 50ft start P3

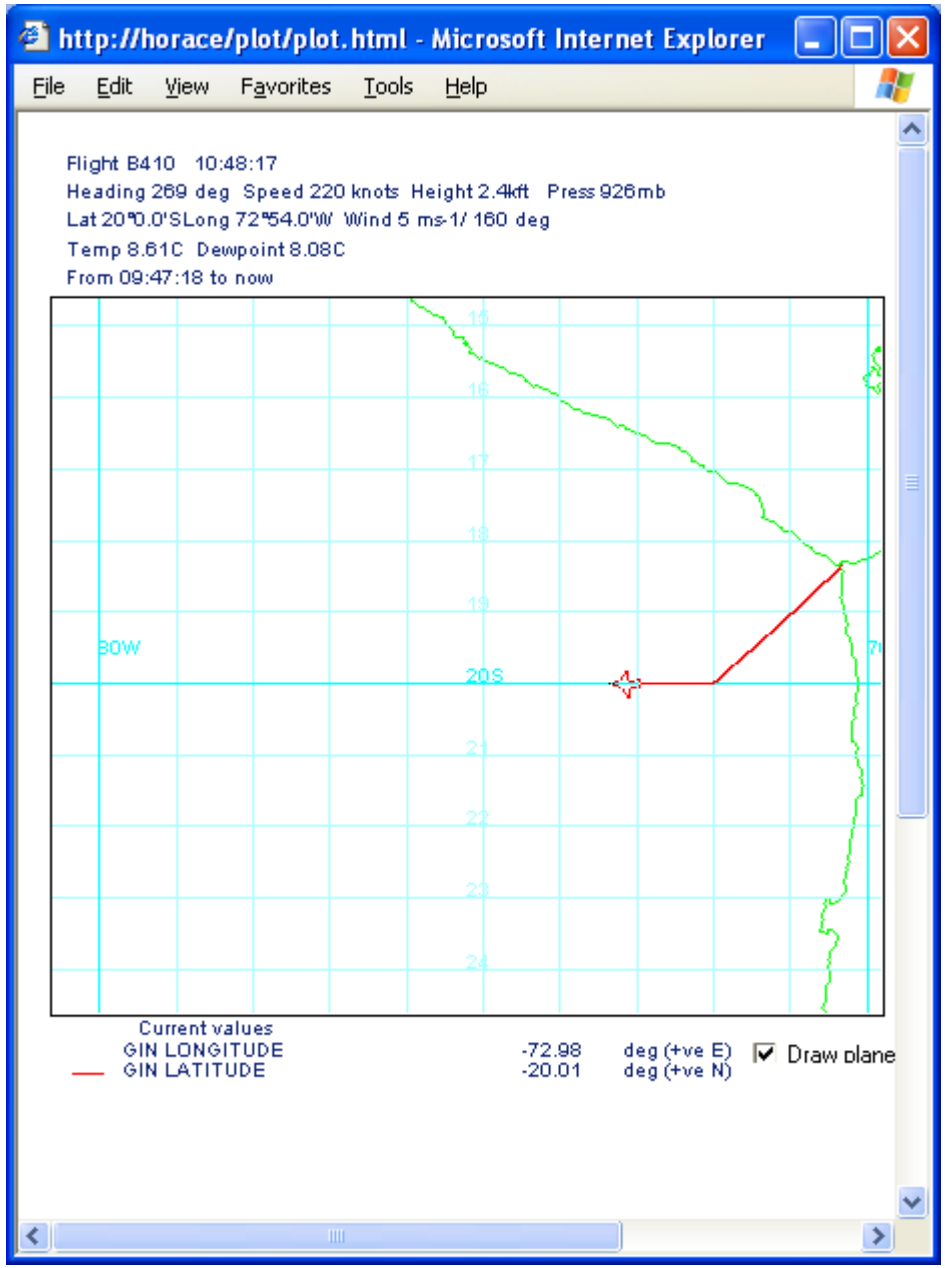
End P3 start R1 at 500ft



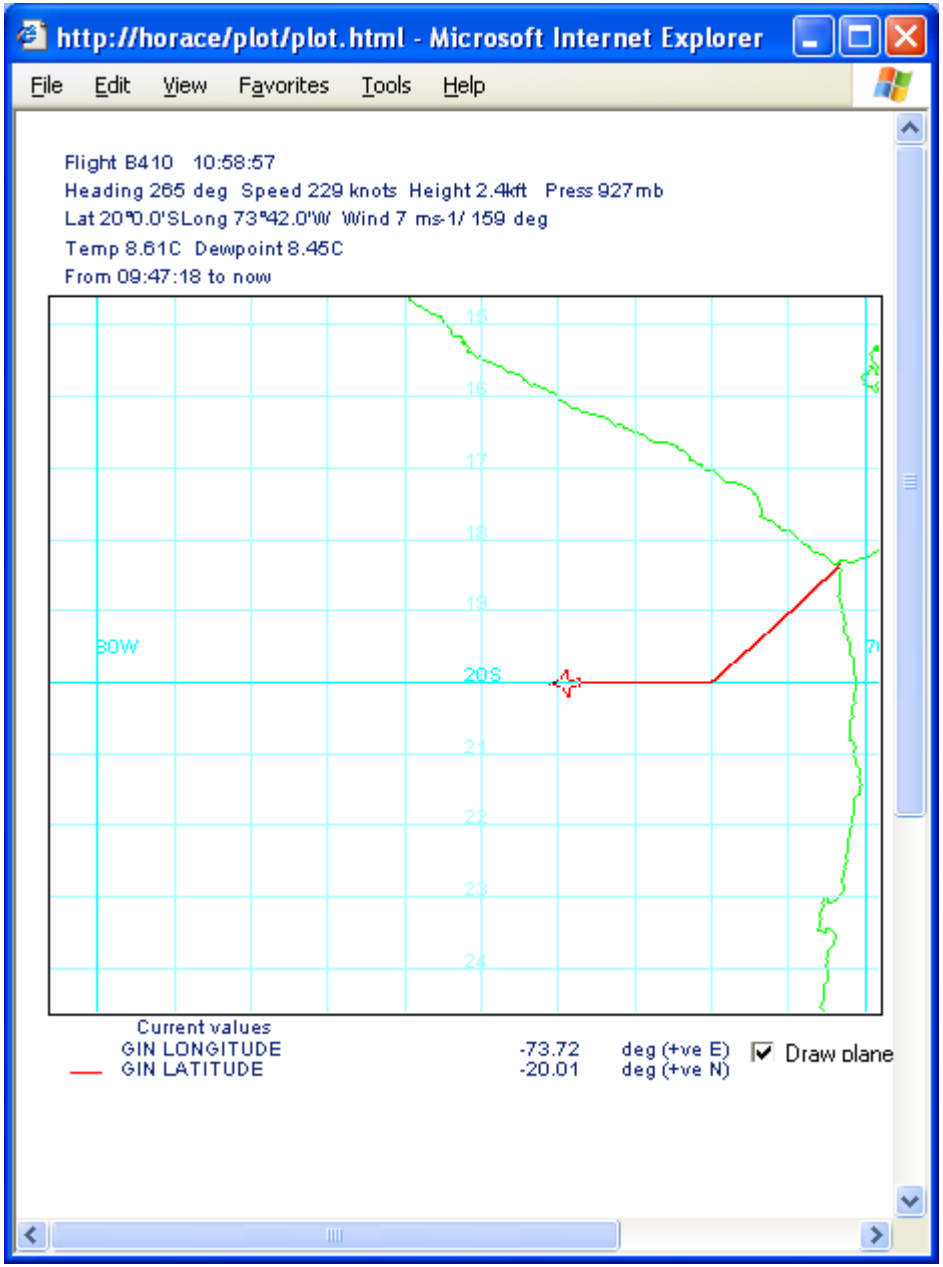


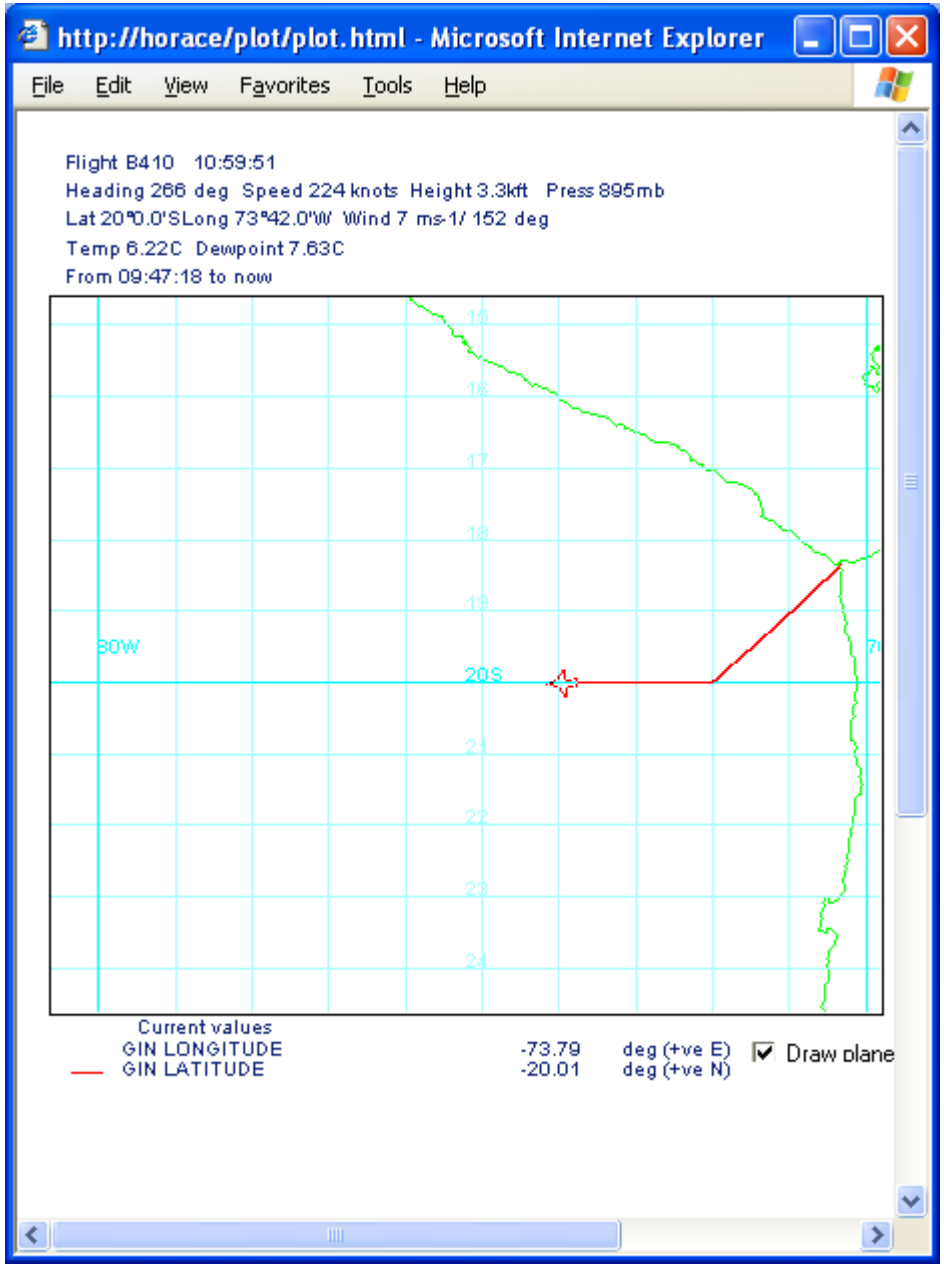
End R2.1 start P5

End P5, R2.2 start but in cloud - dropping down



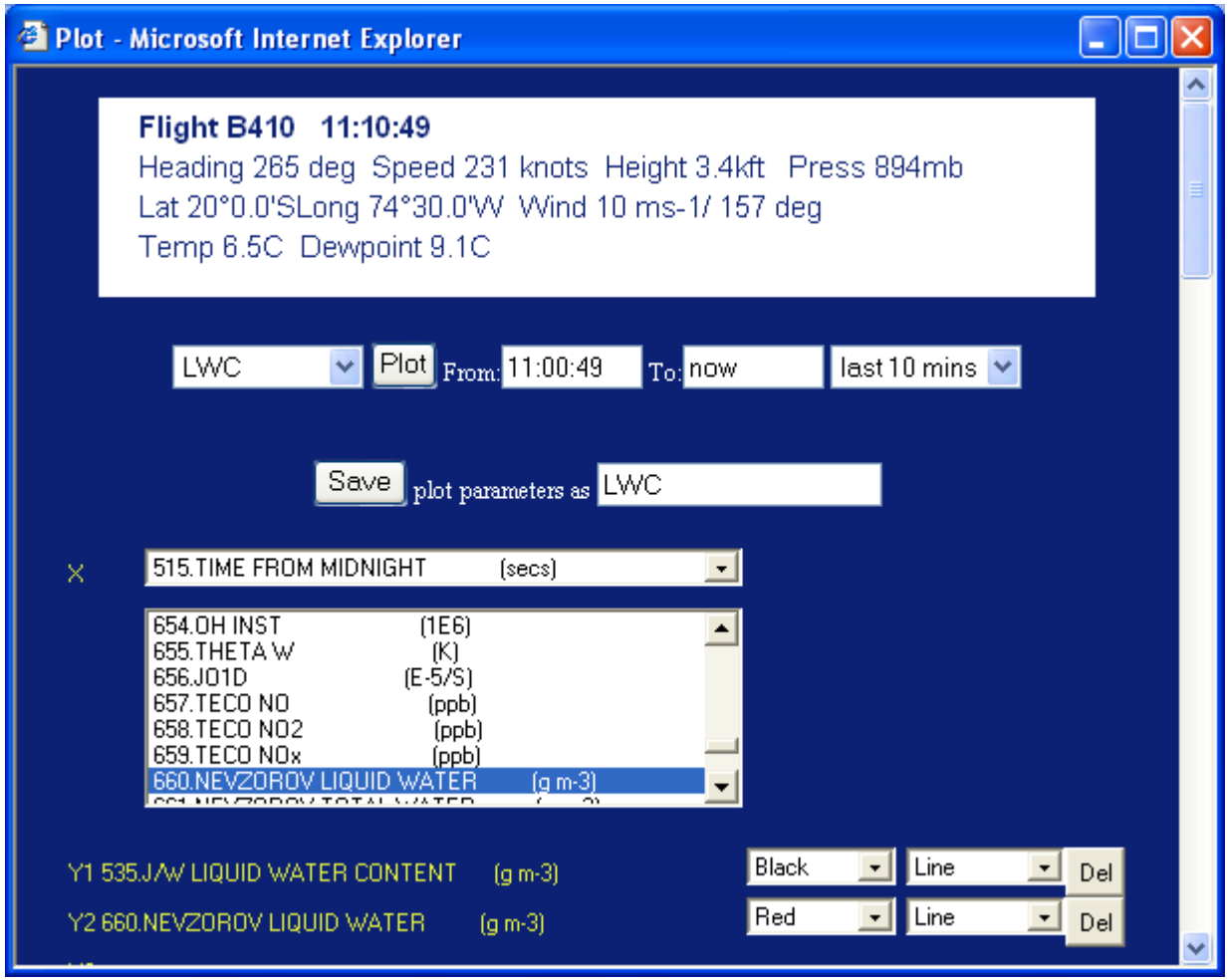
Restarted R2.2 at 2500ft to clear CB for CVI flow cal -



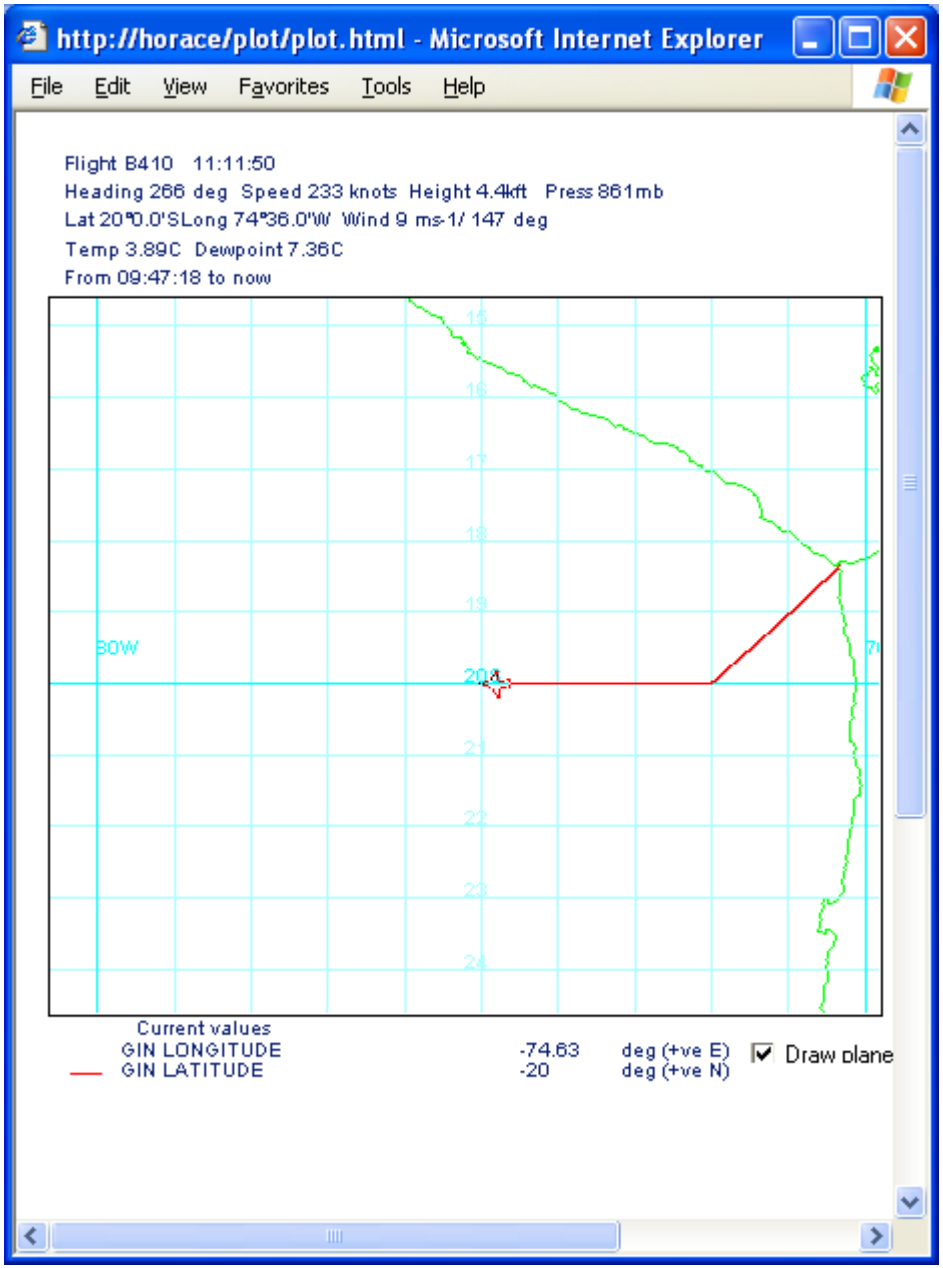


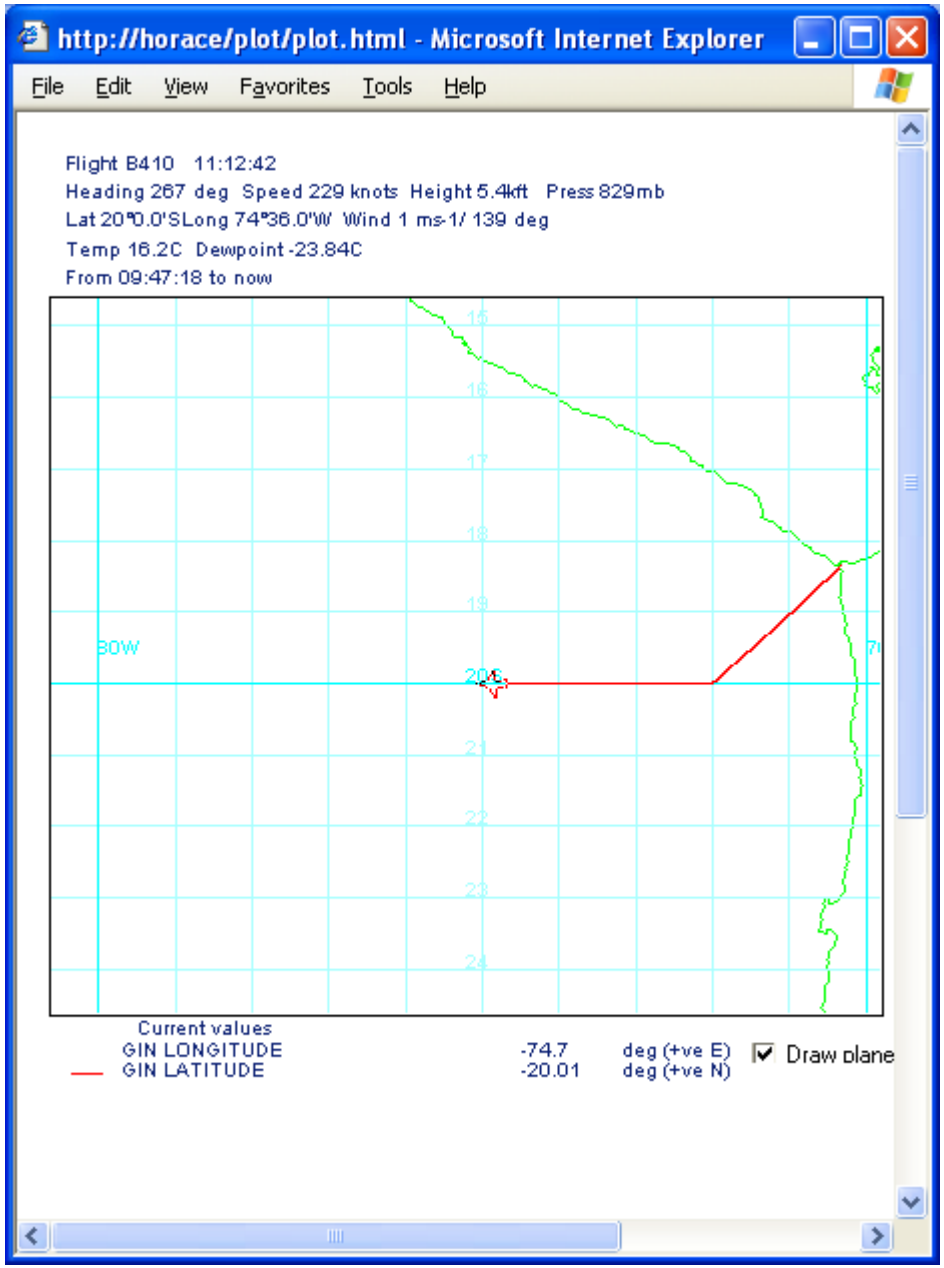
End R2.2 - start P5 to 3500

P5 end R2.3 start incloud at 3500



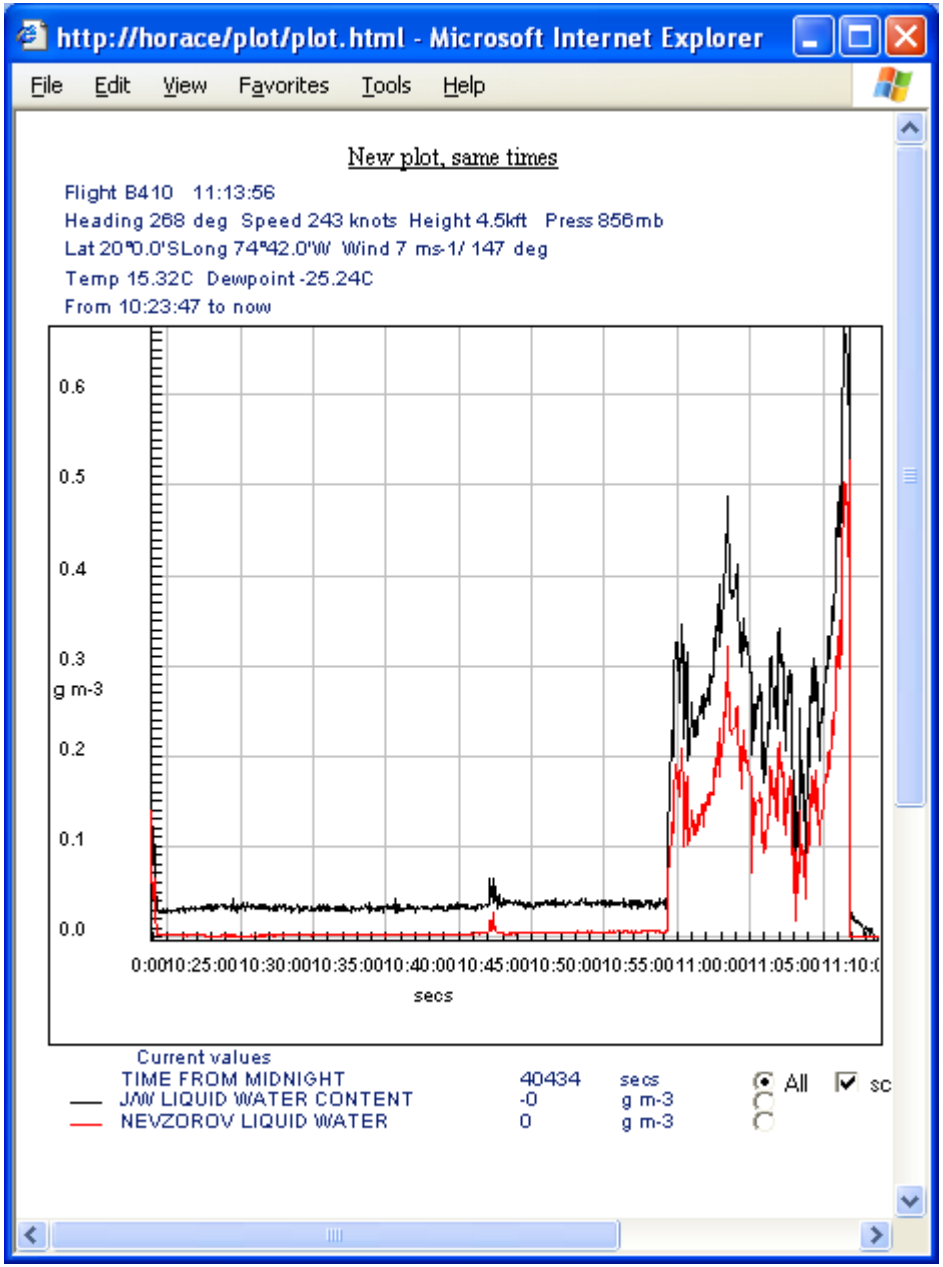
End R2.3 start P6

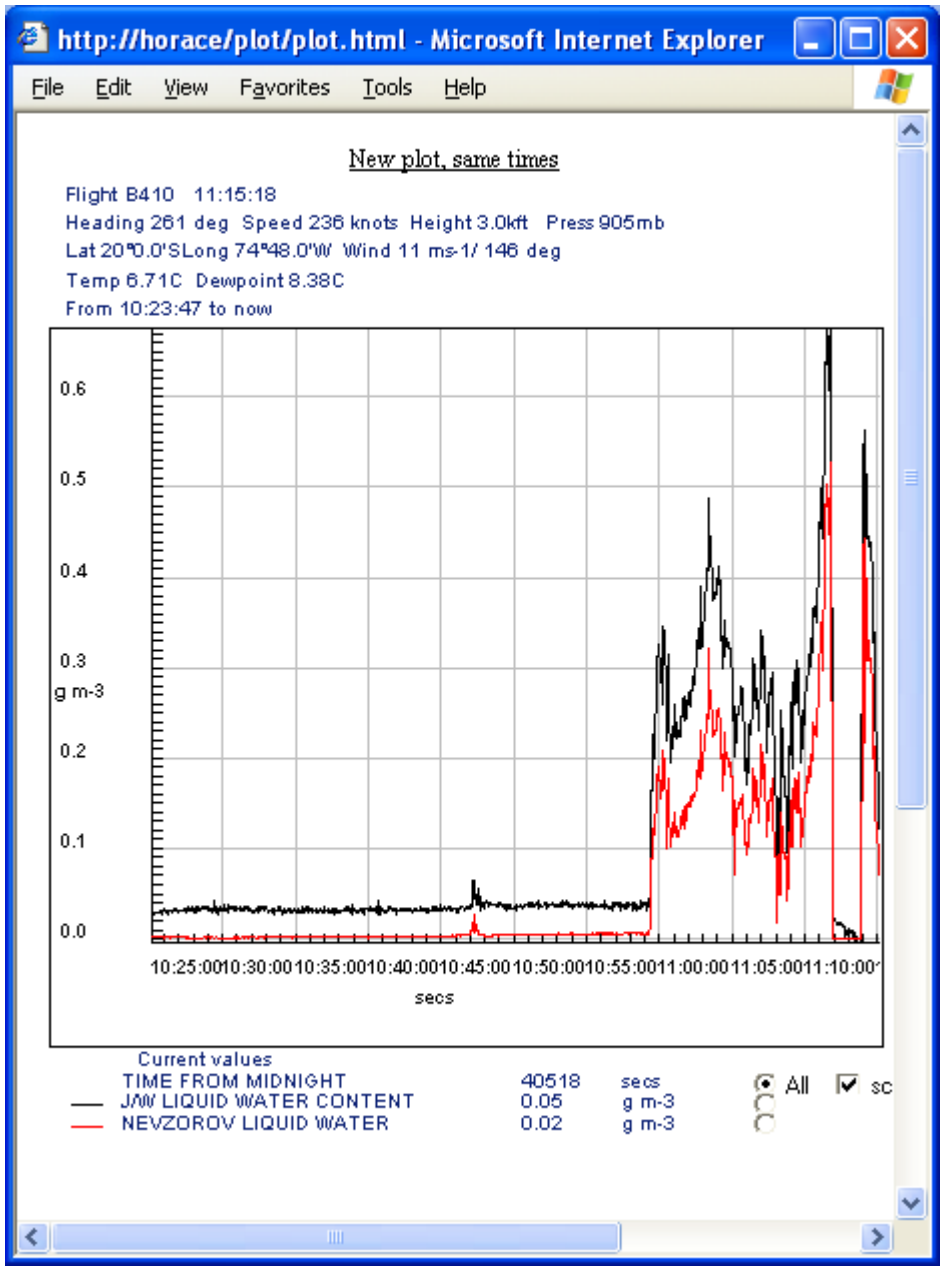




P6 CT at 4600ft

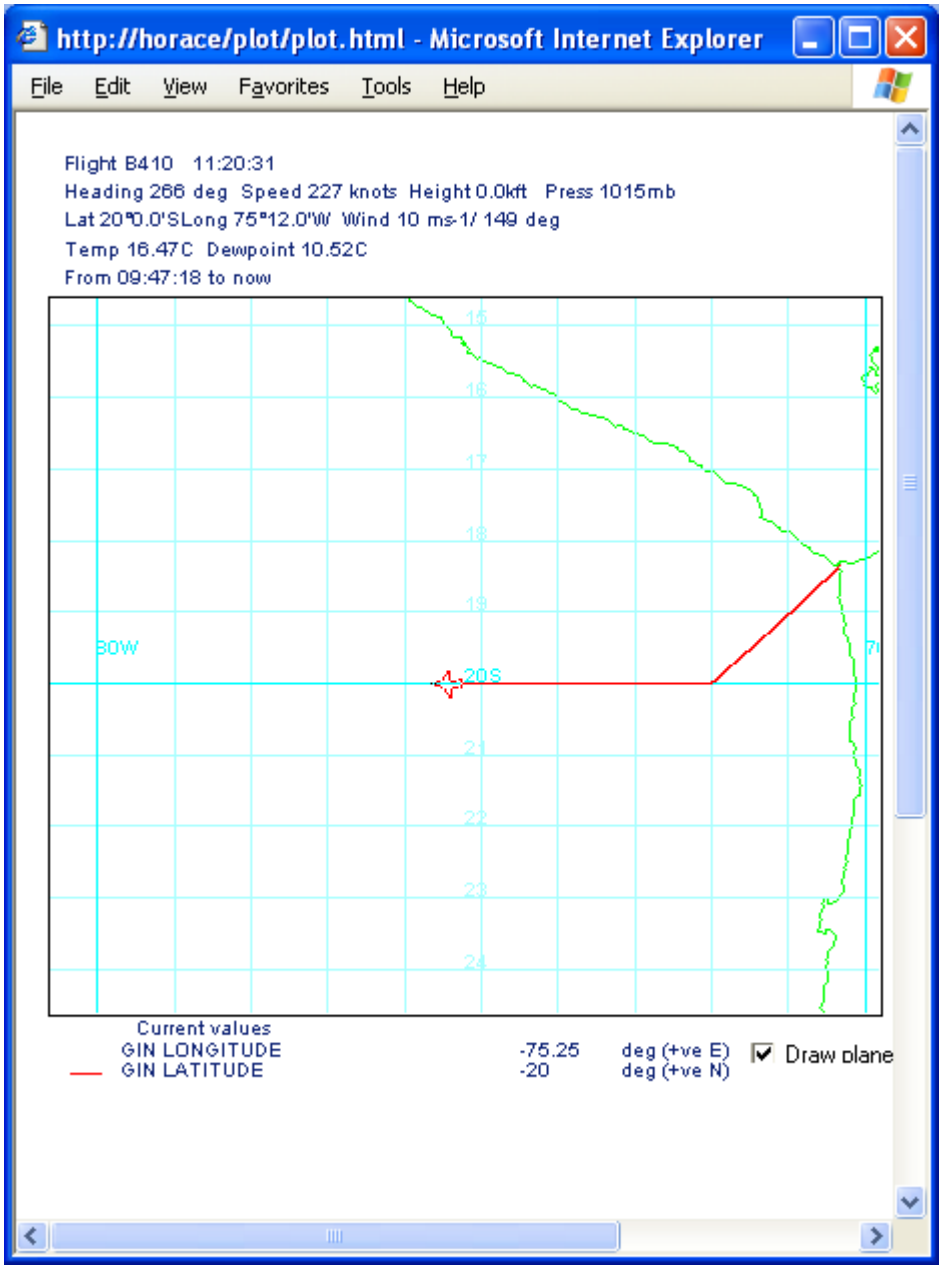
P6 end P7 start 5600ft



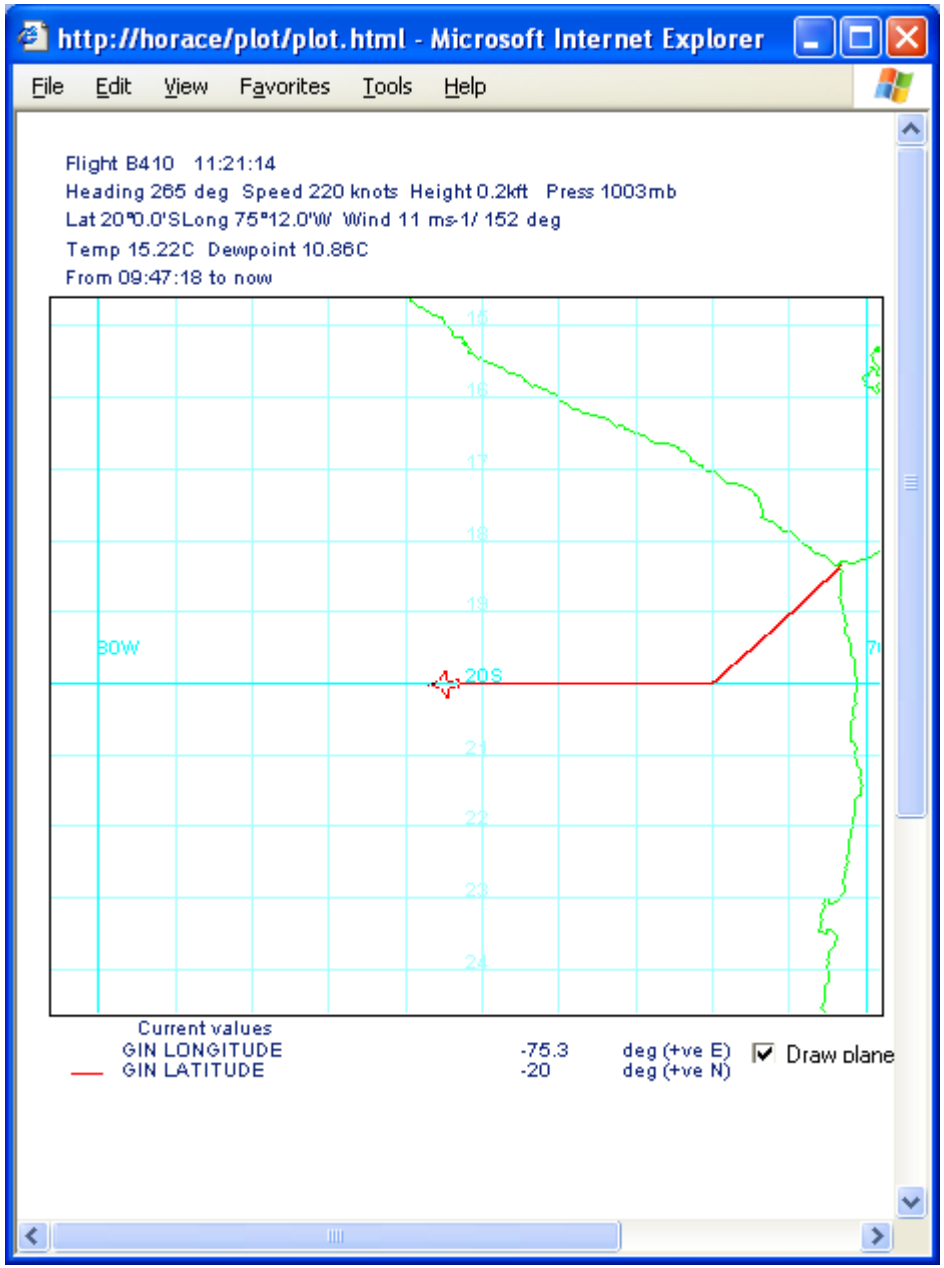


P7 in cloud again

P7 CB ~3100ft



P7 end 50ft P8 start



P8 end R3.1 start at 500ft

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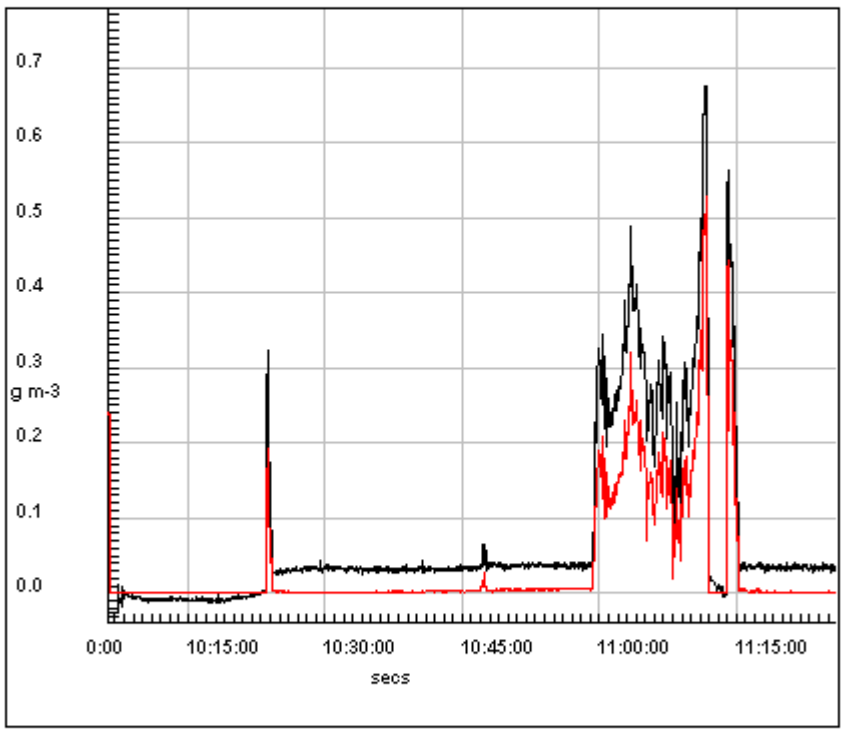
File Edit View Favorites Tools Help

New plot, same times

Flight B410 11:26:44
Heading 266 deg Speed 220 knots Height 0.3kft Press 999mb
Lat 19°54.0'S Long 75°36.0'W Wind 10 ms-1/ 145 deg
Temp 15.03C Dewpoint 10.77C
From start to now



Current values

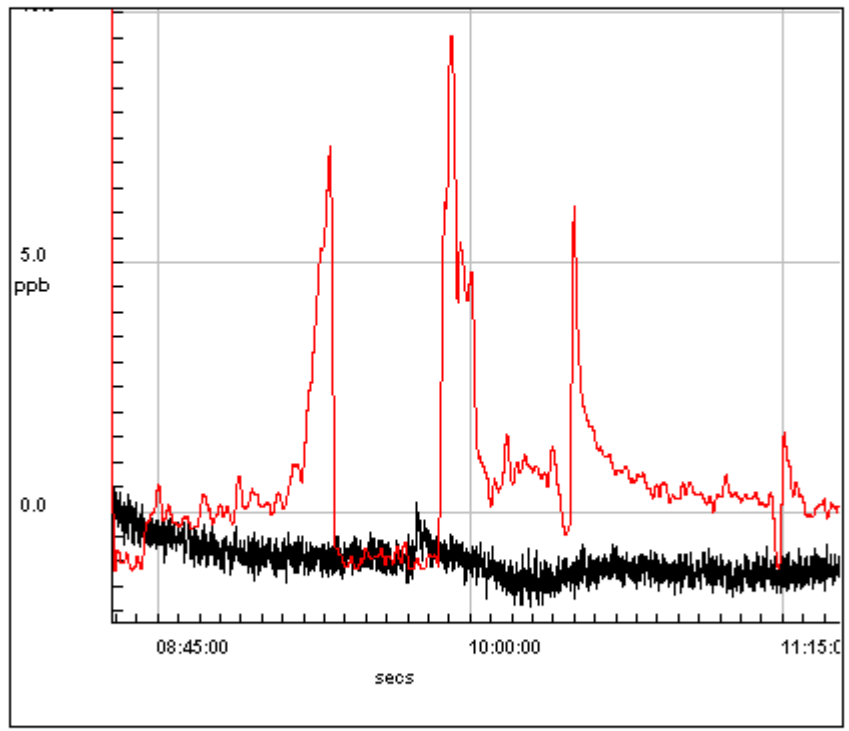
	TIME FROM MIDNIGHT	41202	secs	All sc
—	JW LIQUID WATER CONTENT	0.03	g m-3	
—	NEVZOROV LIQUID WATER	0	g m-3	

http://horace/plot/plot.html - Microsoft Internet Explorer

File Edit View Favorites Tools Help

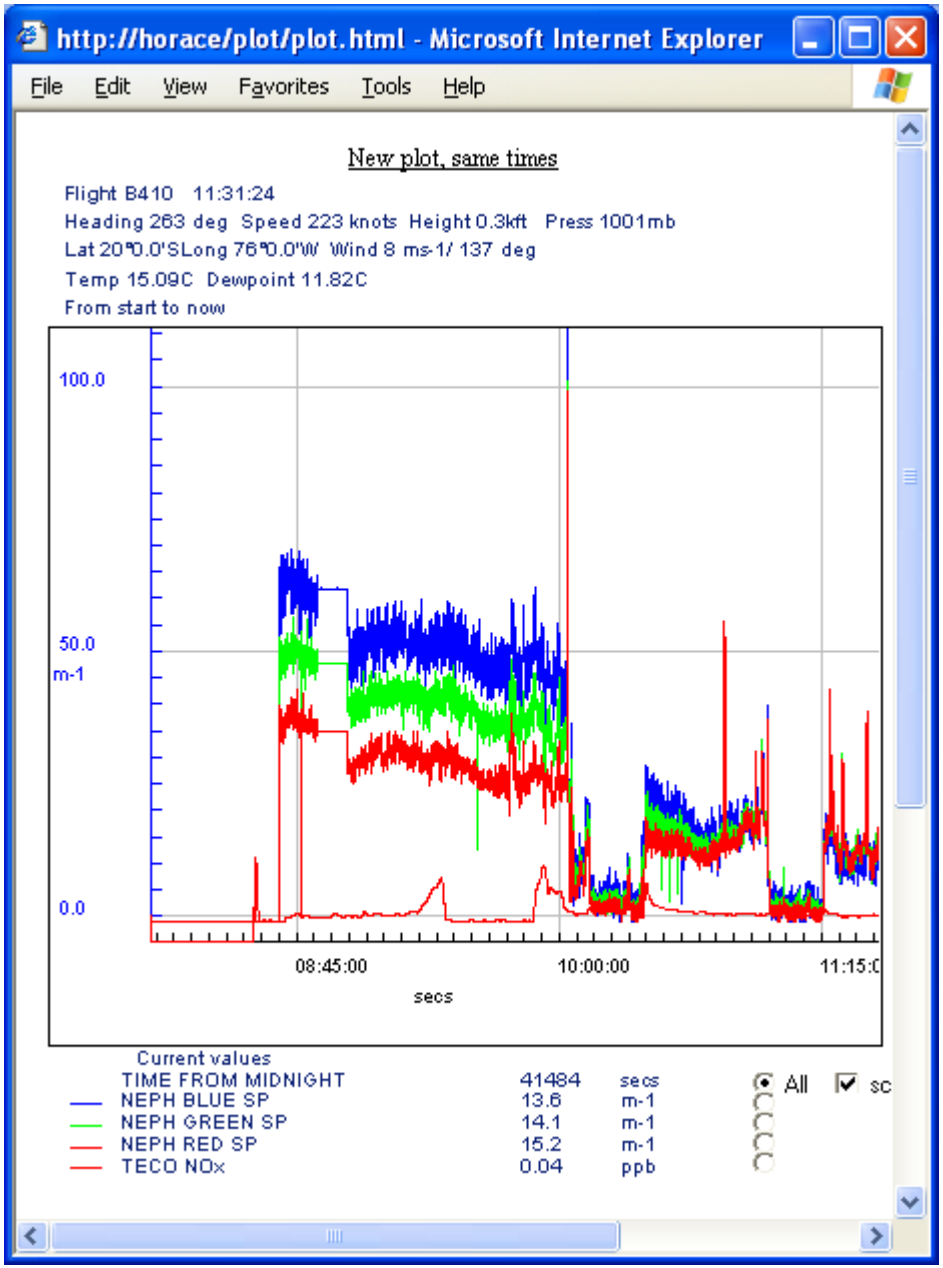
New plot, same times

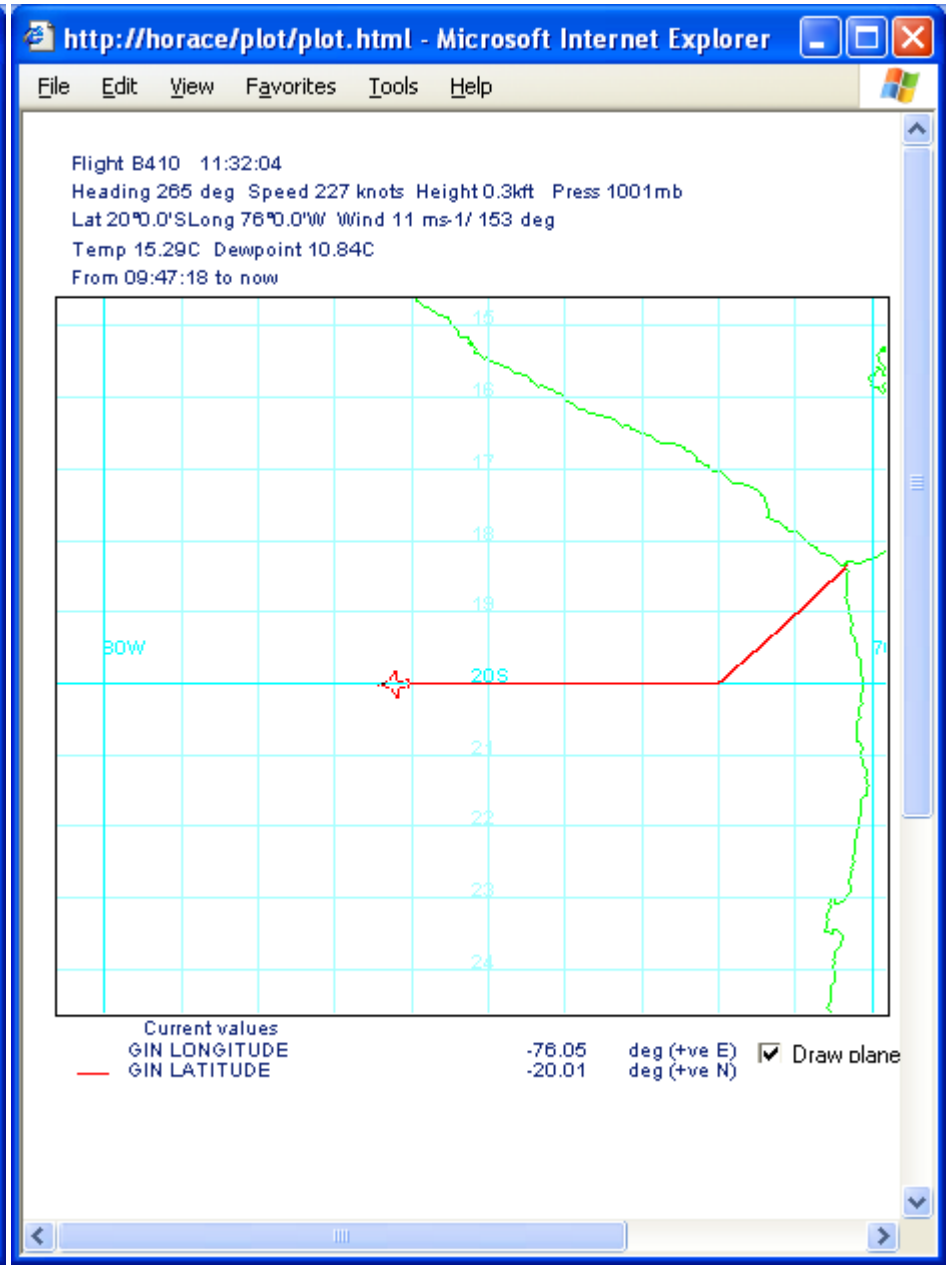
Flight B410 11:29:24
Heading 260 deg Speed 228 knots Height 0.2kft Press 1002mb
Lat 19°54.0'S Long 75°48.0'W Wind 10 ms-1/ 151 deg
Temp 15.27C Dewpoint 10.46C
From start to now



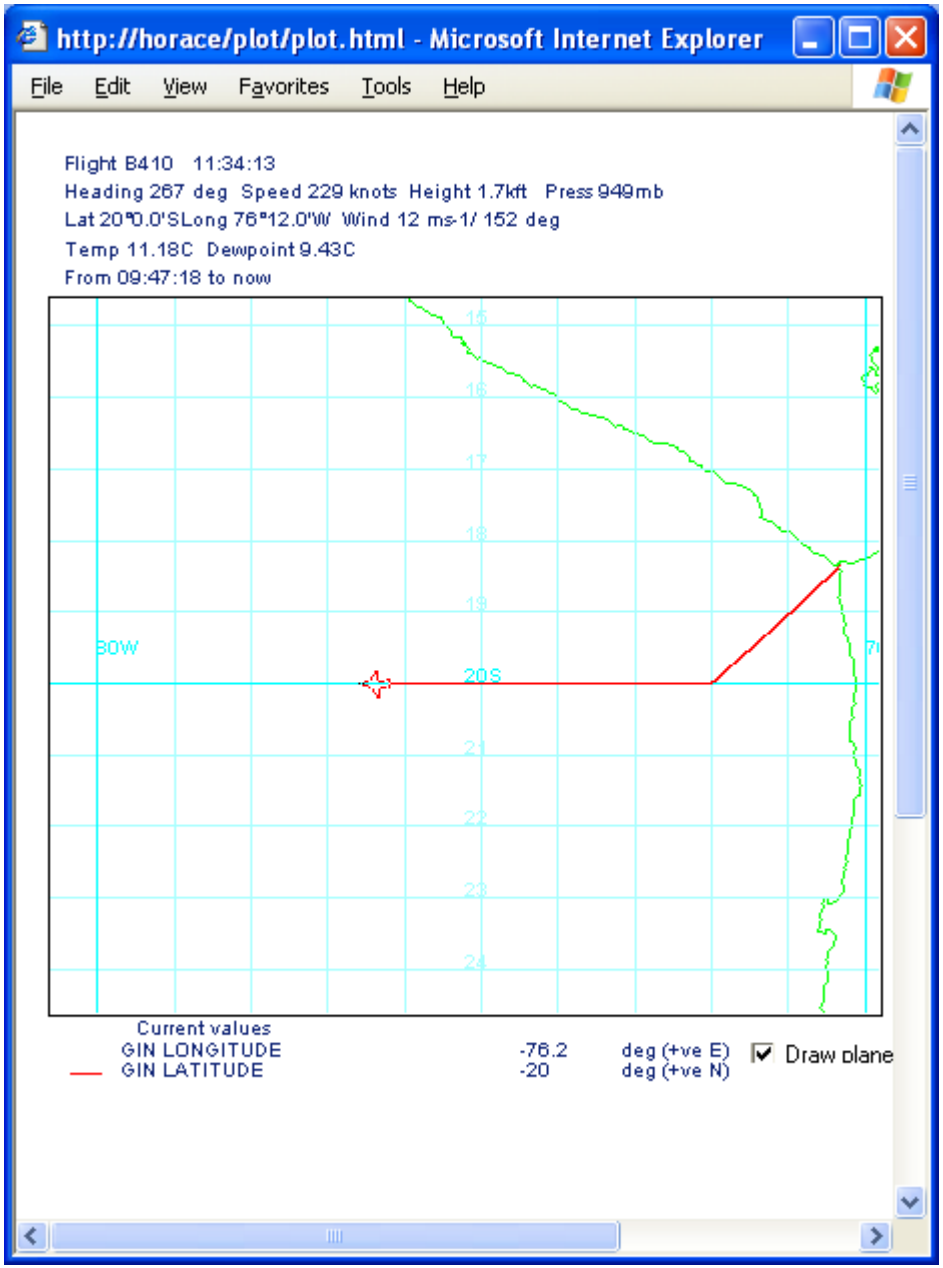
Current values

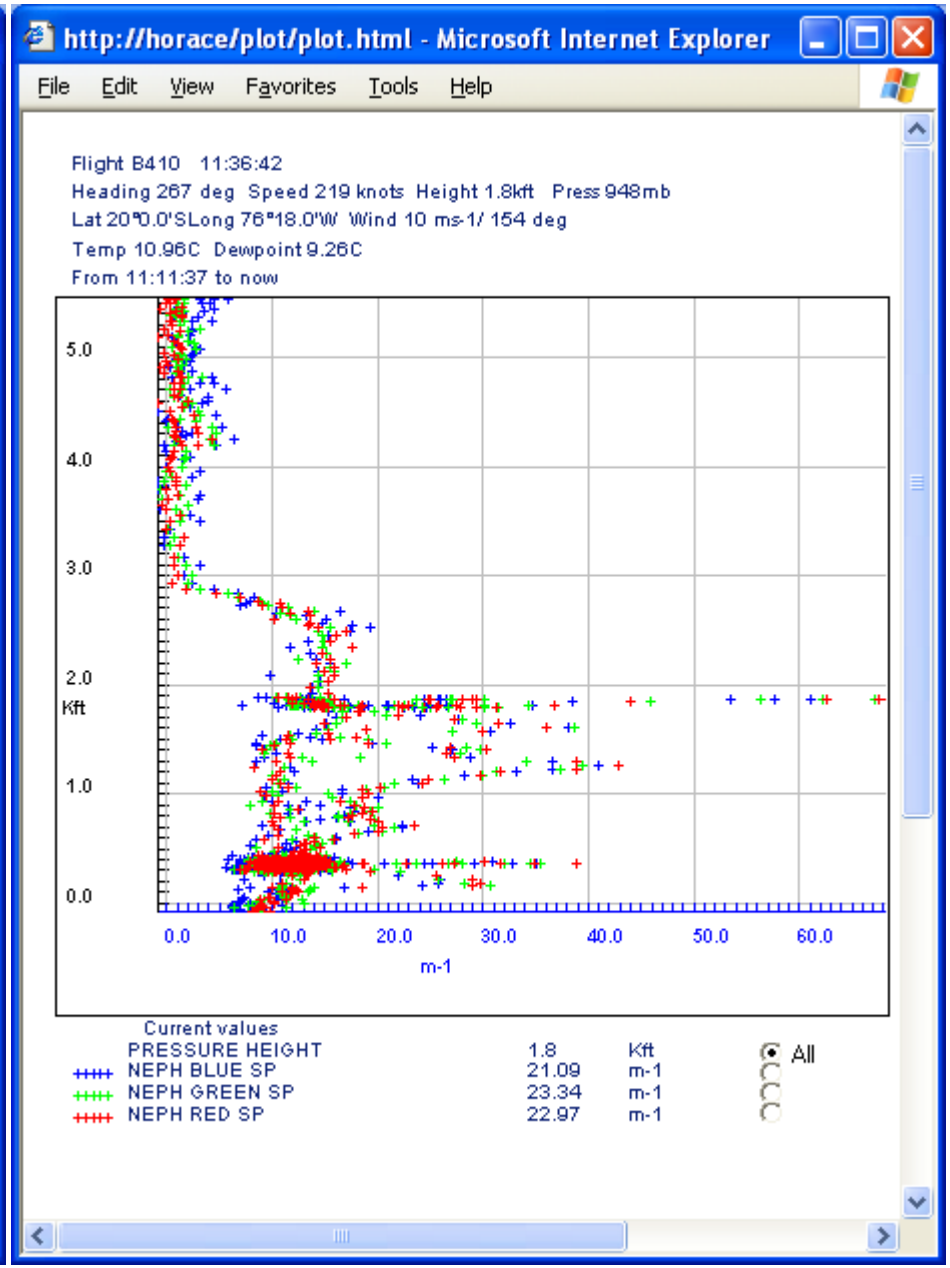
	TIME FROM MIDNIGHT	41364	secs	All sc
—	TECO SO2	-1.34	ppb	
—	TECO NOx	0.1	ppb	





R3.1 end P9 start





P9 end R3.2 start at 2000ft

Layers below CB - maybe the drizzle is cause

http://horace/plot/plot.html - Microsoft Internet Explorer

File Edit View Favorites Tools Help

New plot, same times

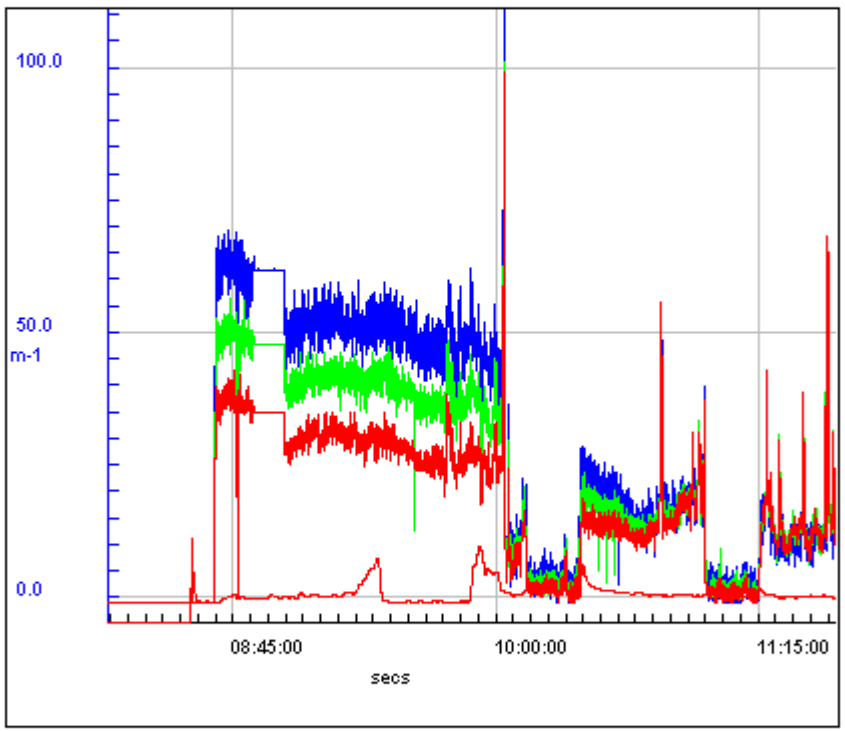
Flight B410 11:37:40

Heading 267 deg Speed 219 knots Height 1.8kft Press 947mb

Lat 20°0.0'S Long 76°24.0'W Wind 10 ms-1/ 154 deg

Temp 10.81C Dewpoint 8.74C

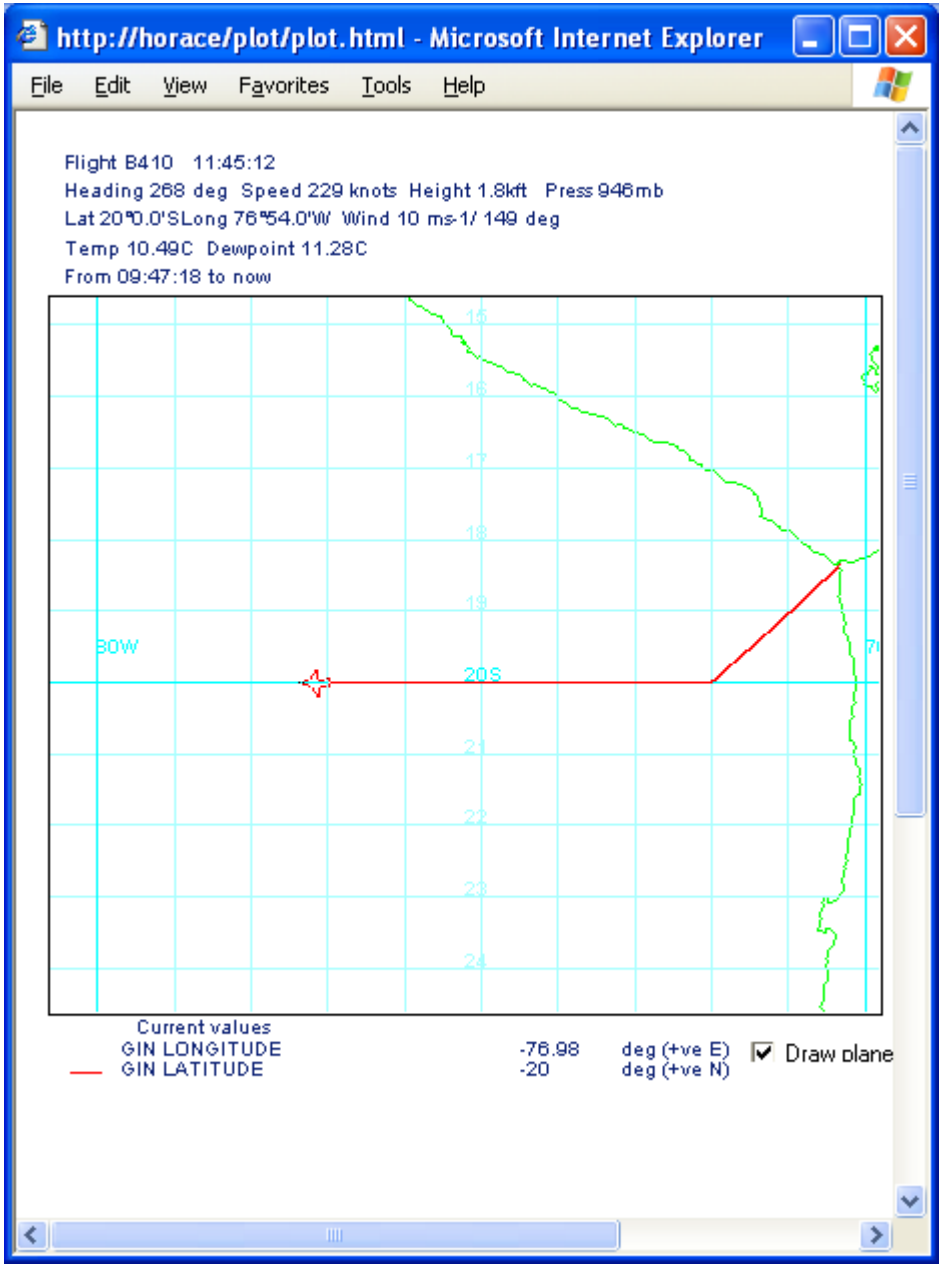
From start to now

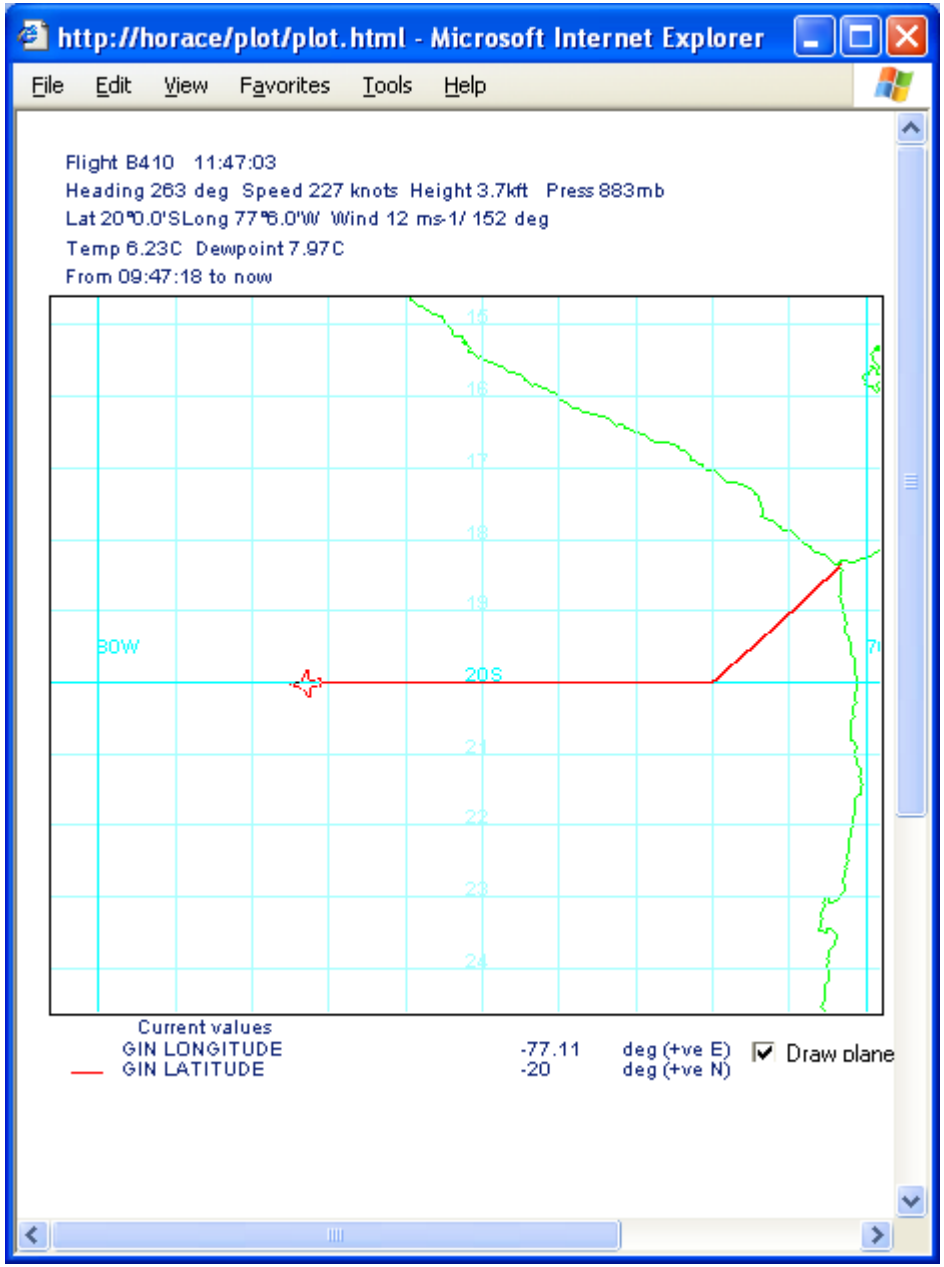


Current values

TIME FROM MIDNIGHT	41859	secs	
NEPH BLUE SP	9.08	m-1	
NEPH GREEN SP	9.17	m-1	
NEPH RED SP	8.99	m-1	
TECO NOx	-0.26	ppb	

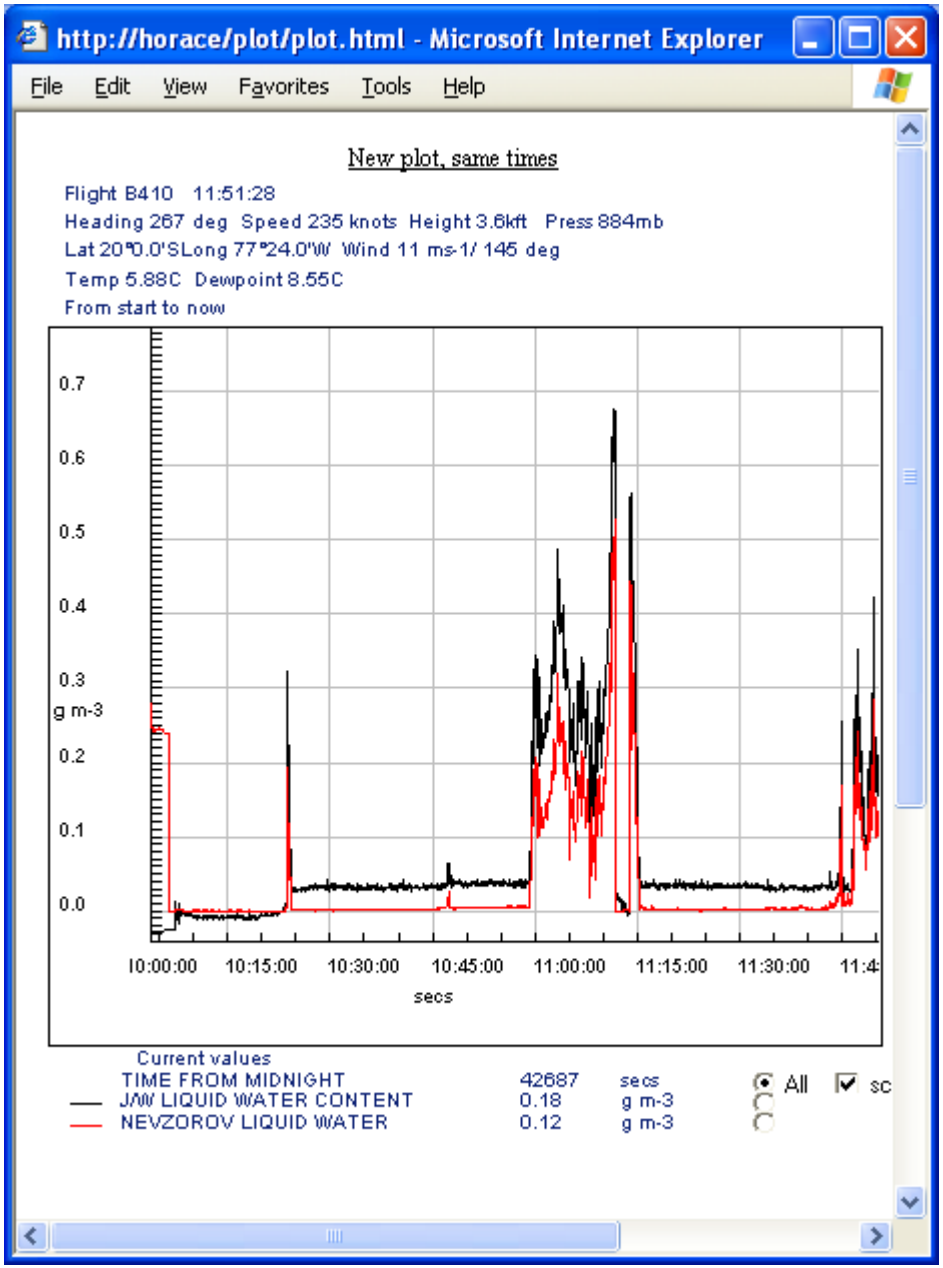
All sc

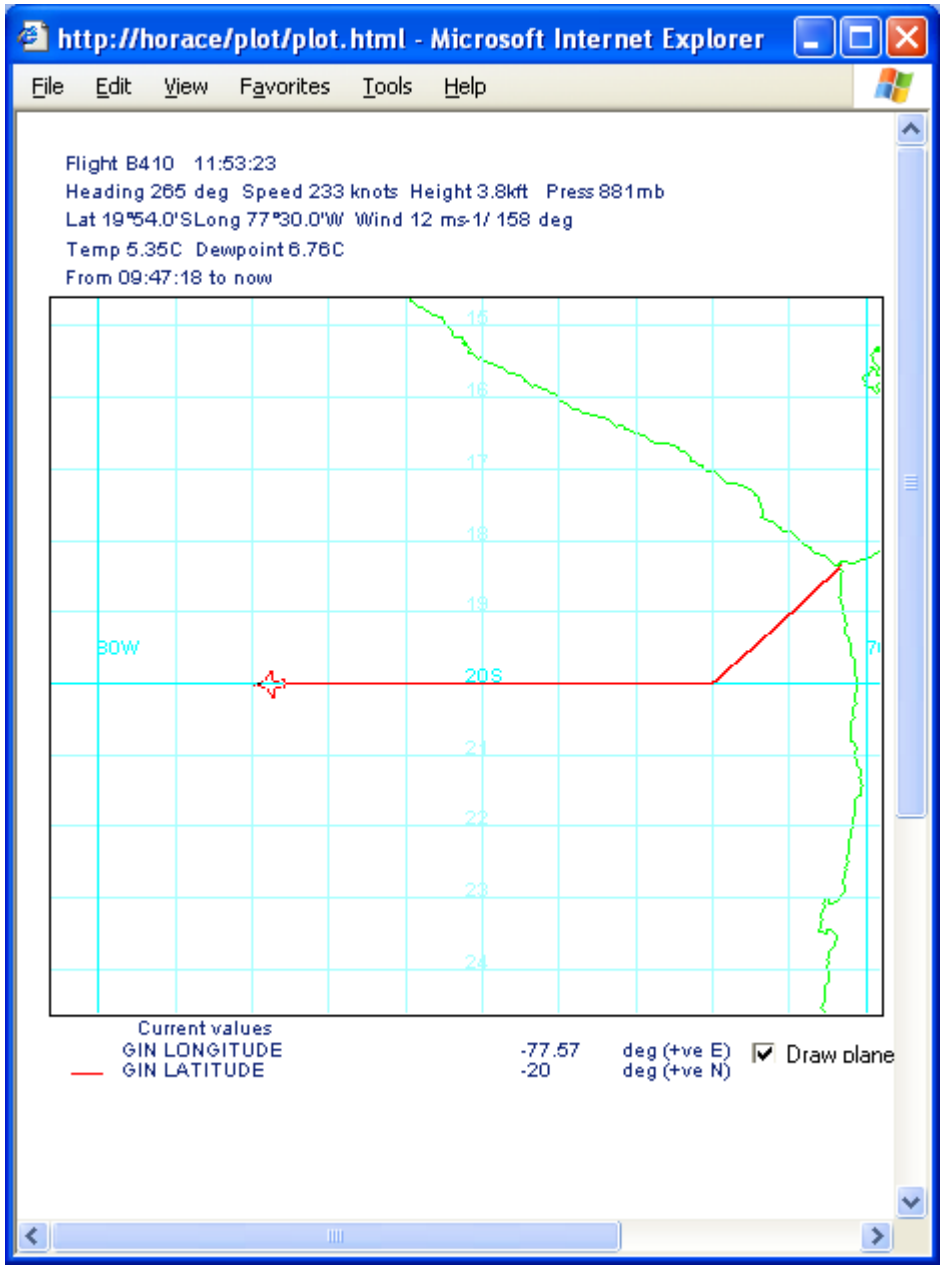




End R 3.2

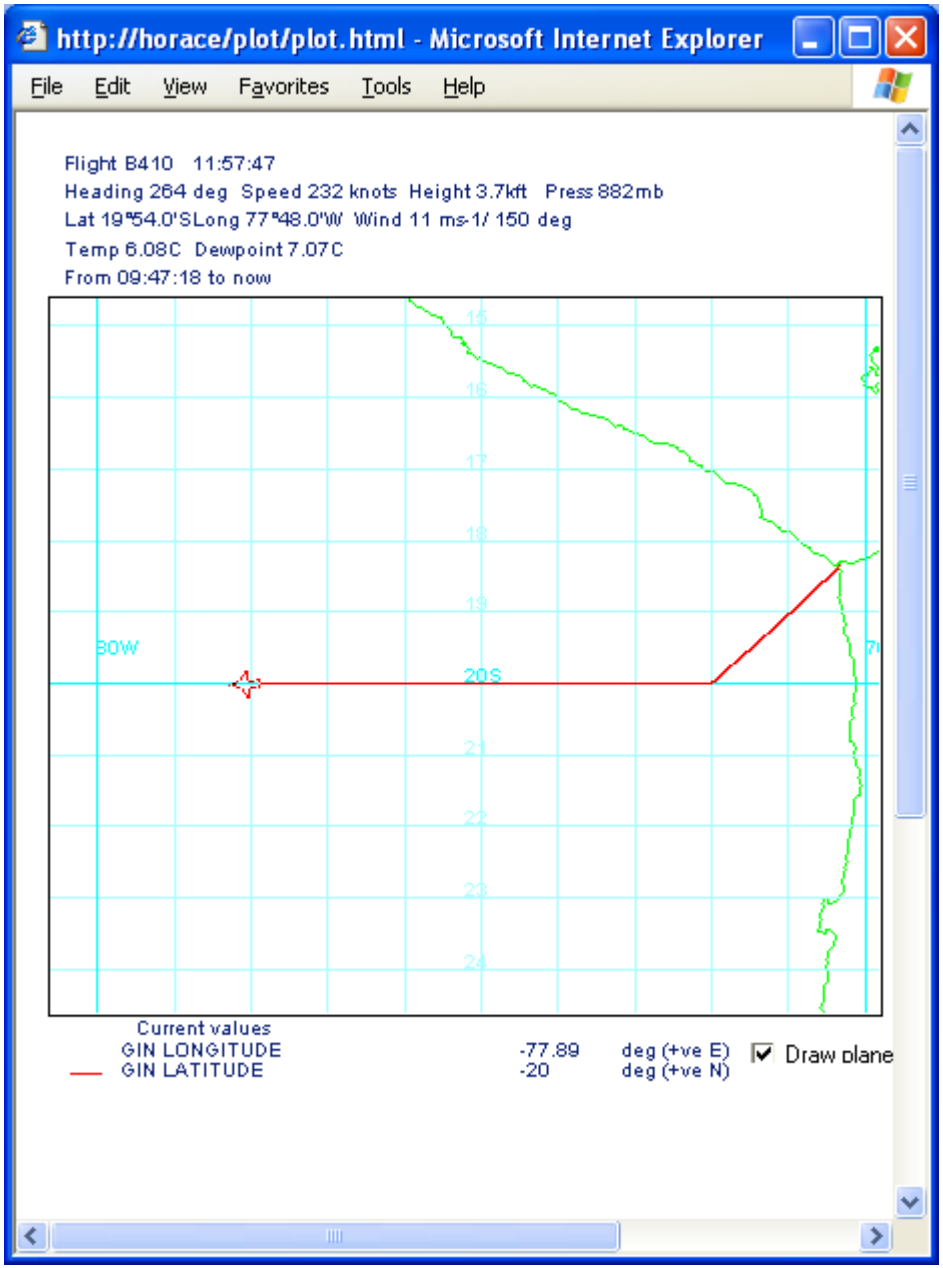
End p10 start R3.3

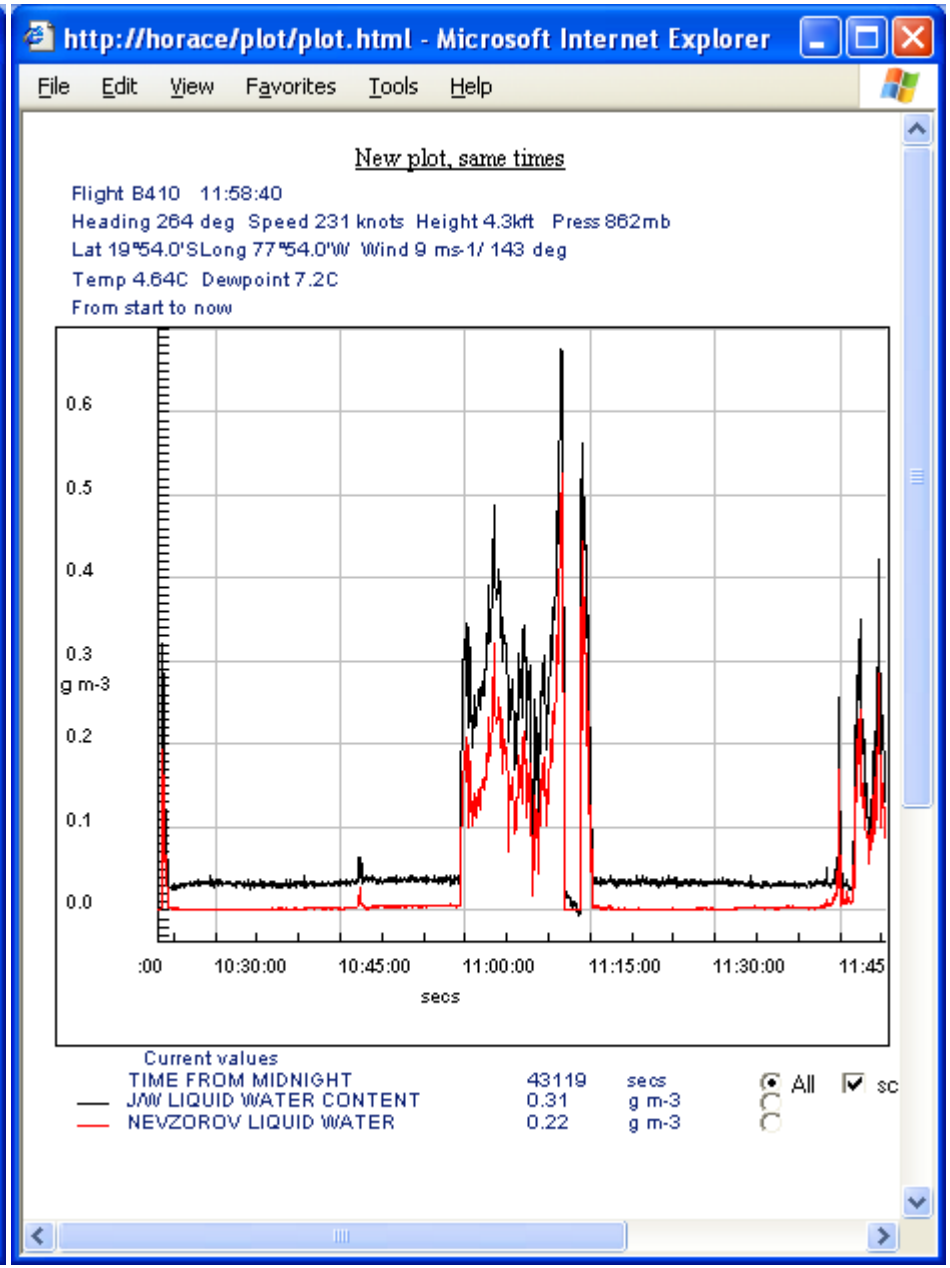




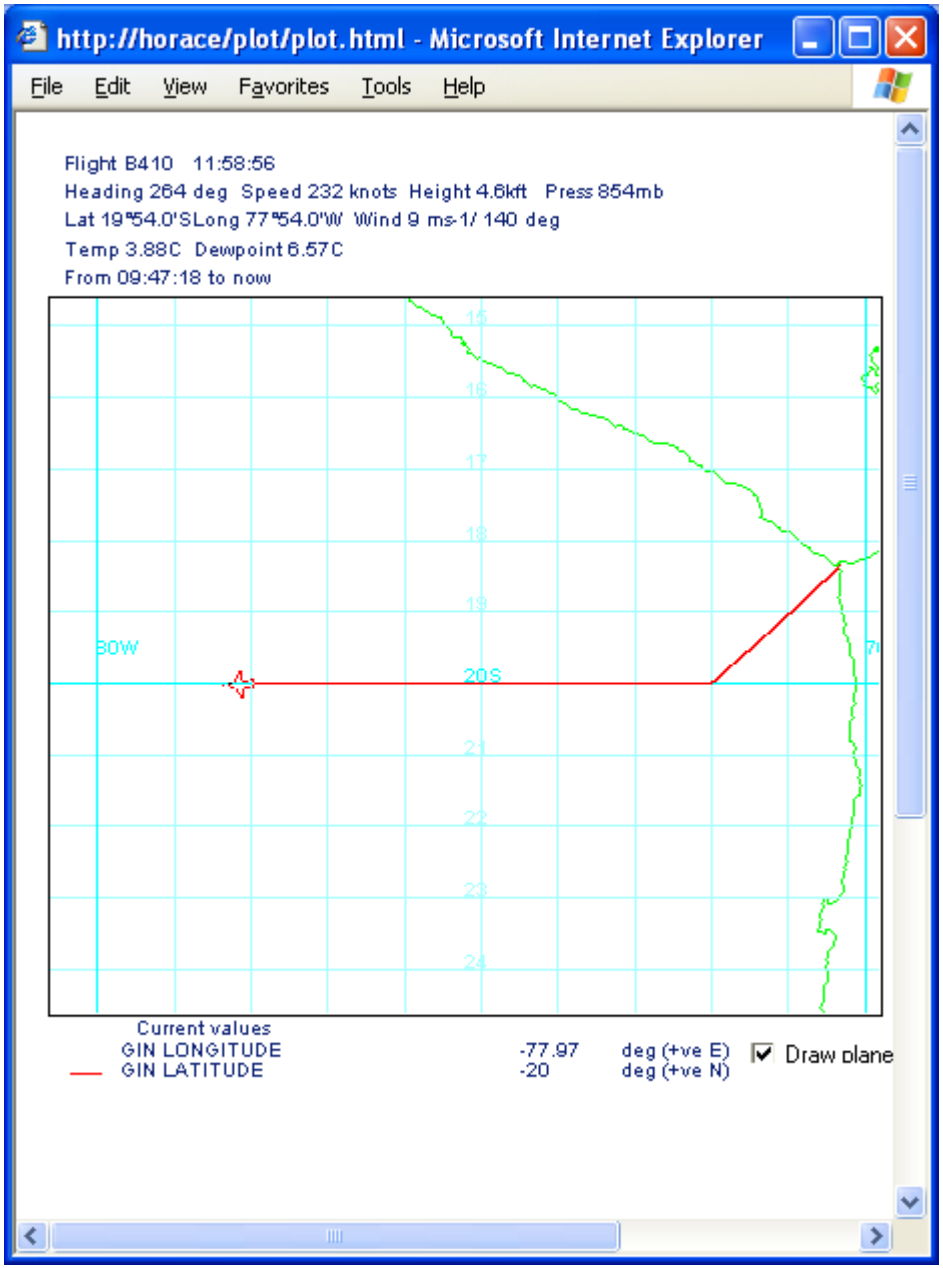
R3.3 in cloud

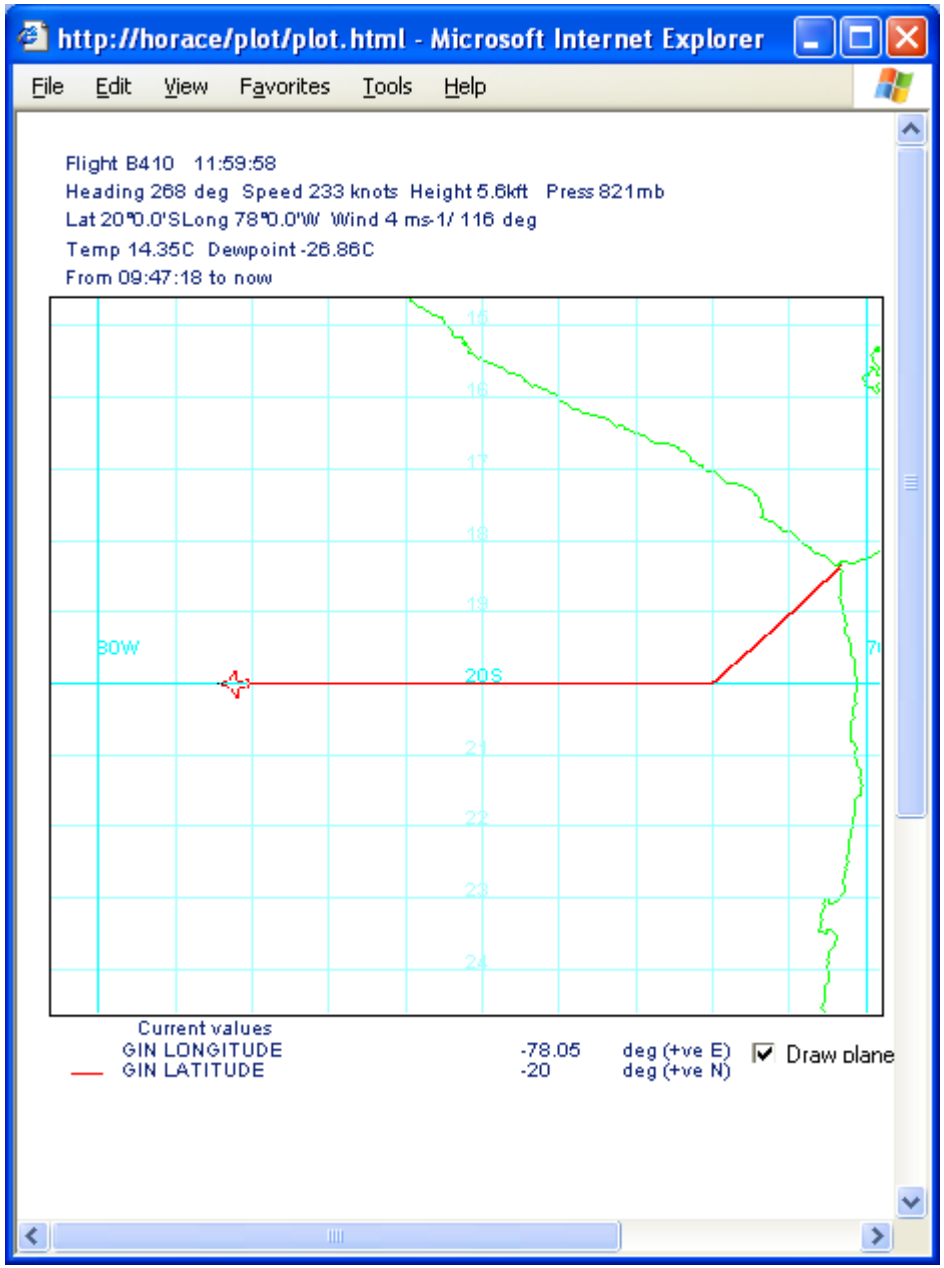
Hole in cloud





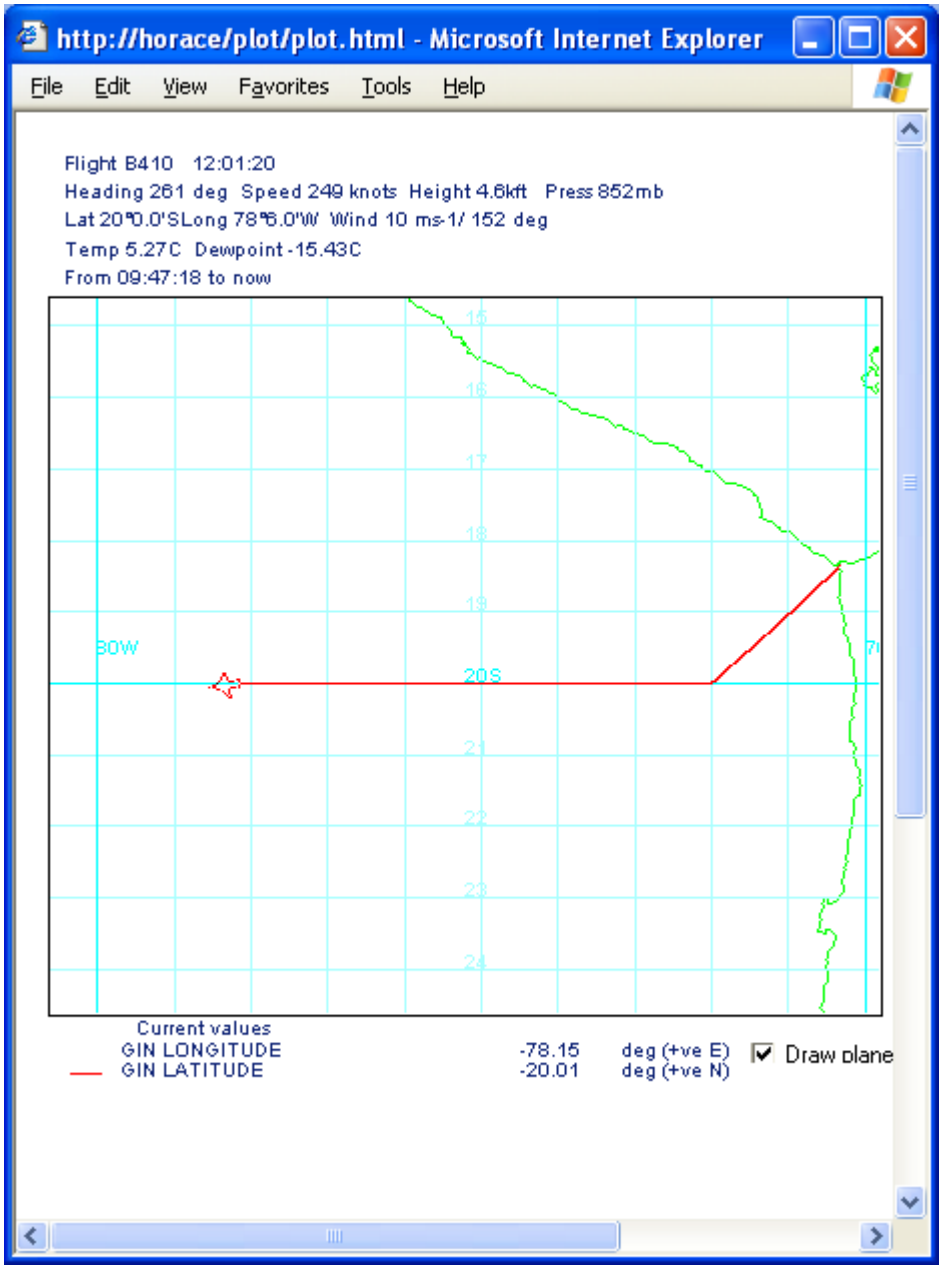
End R3.3 P11 start at 4000ft in a hole

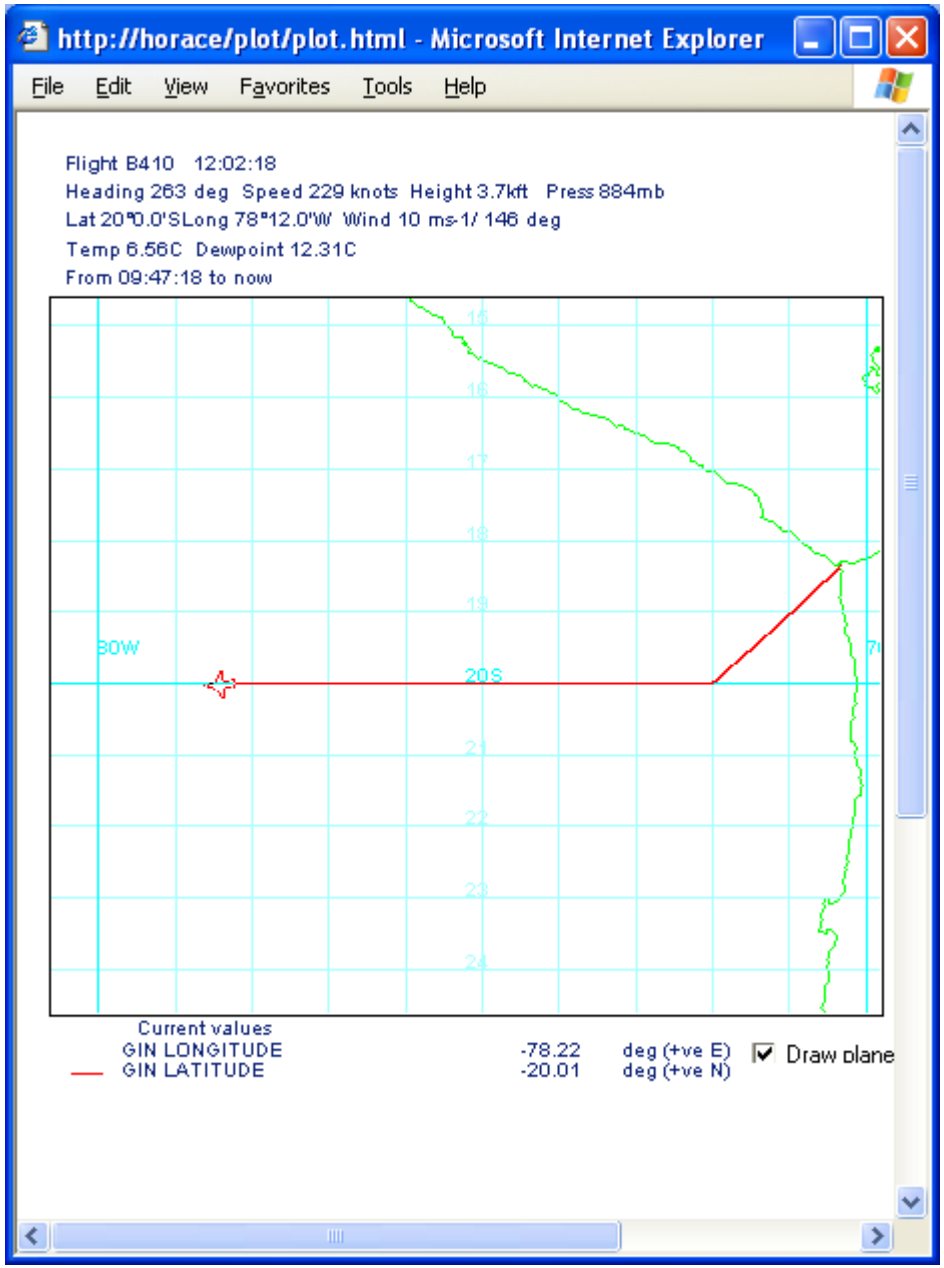




CT at 4900ft

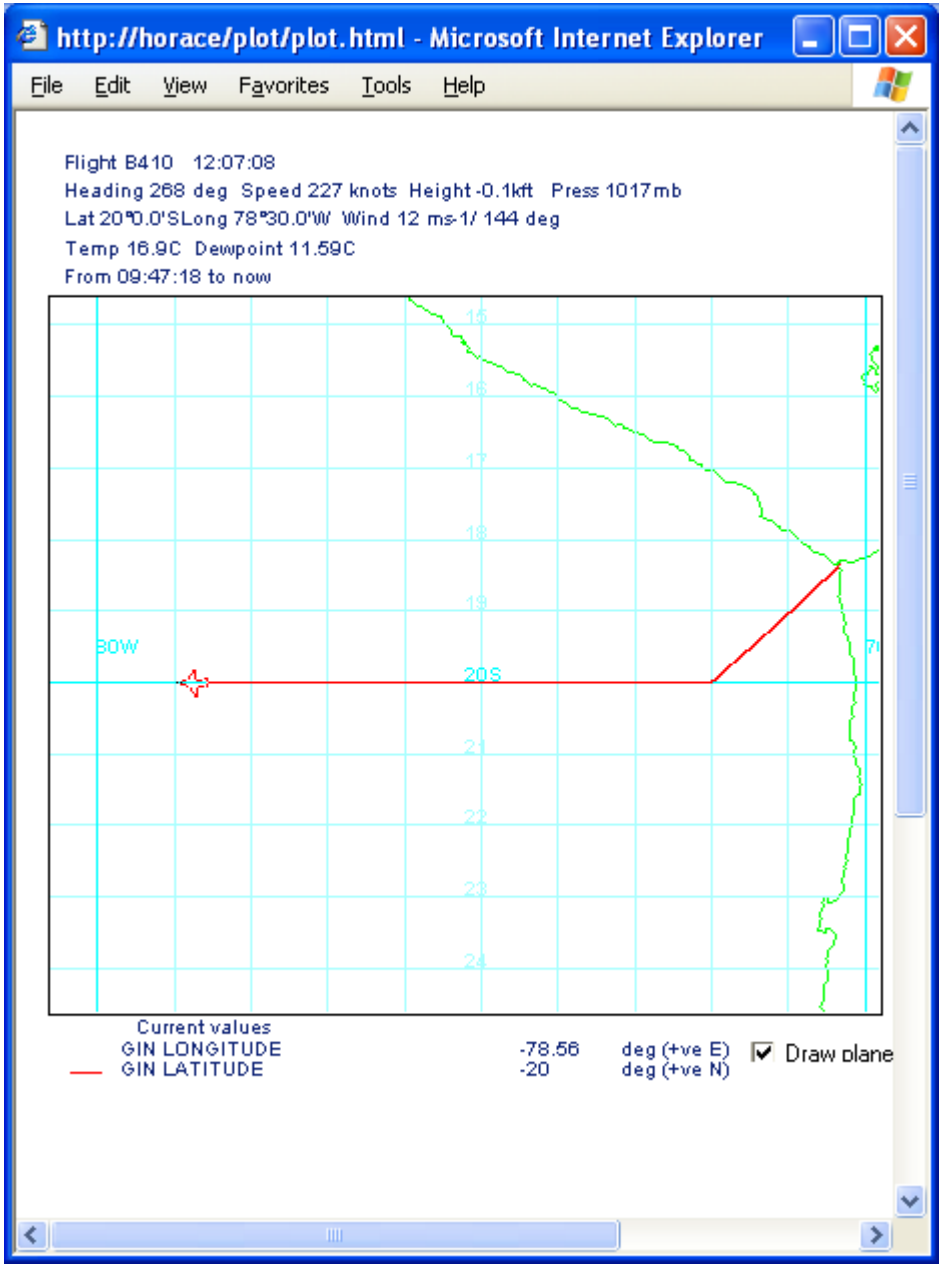
End P11 start P12

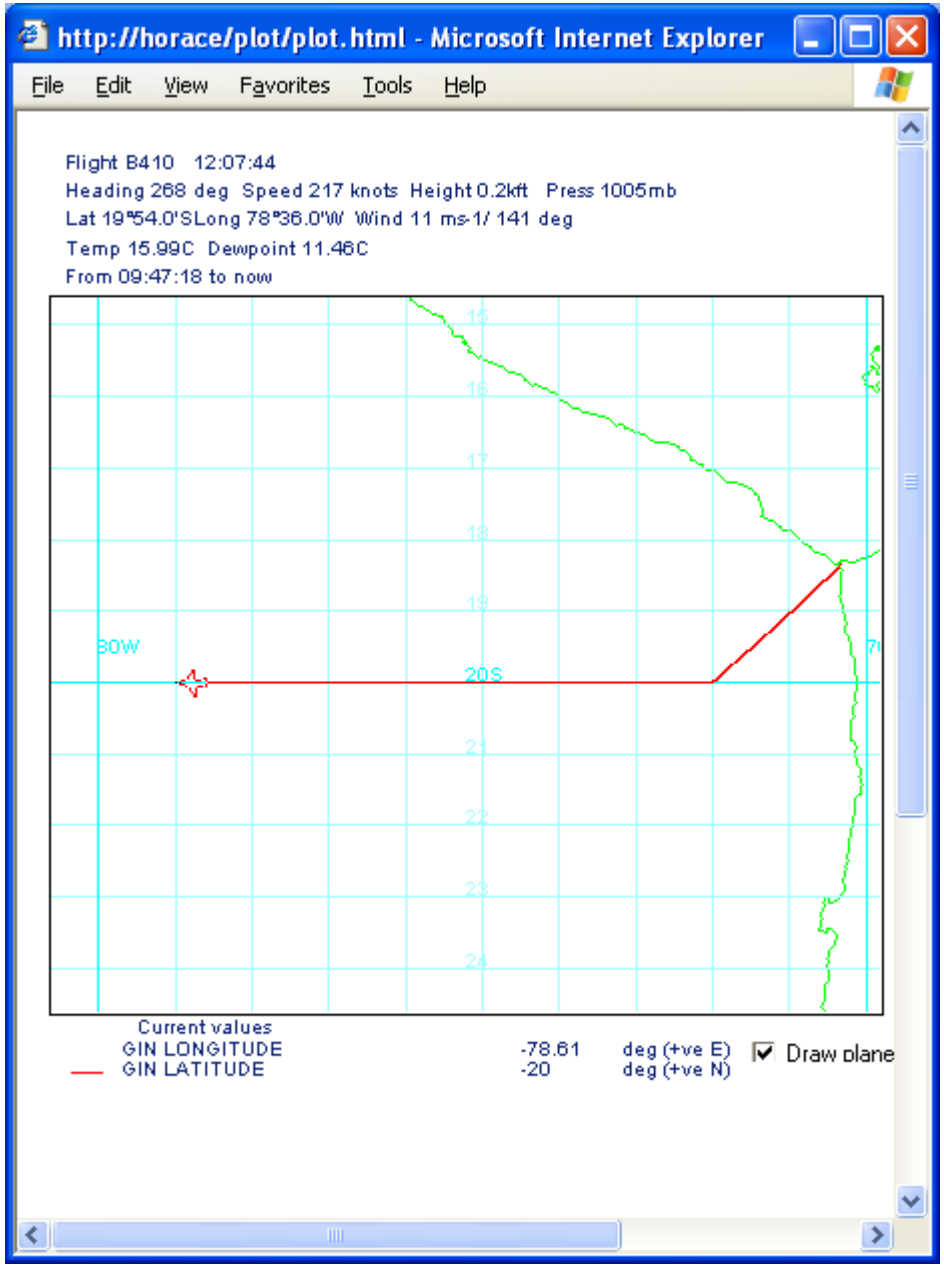




P12 CT at 4900ft

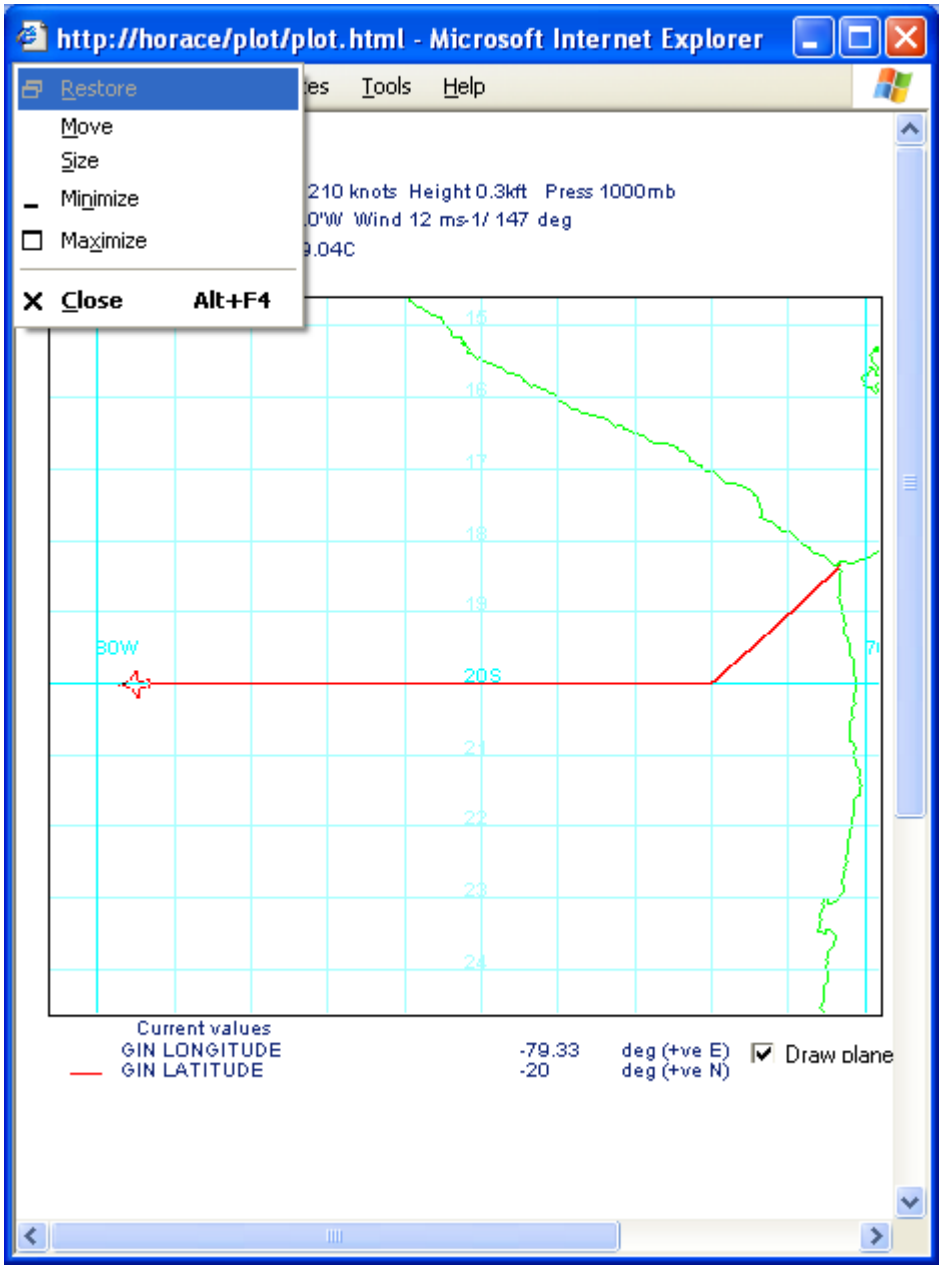
P12 CB 4000ft-3800ft



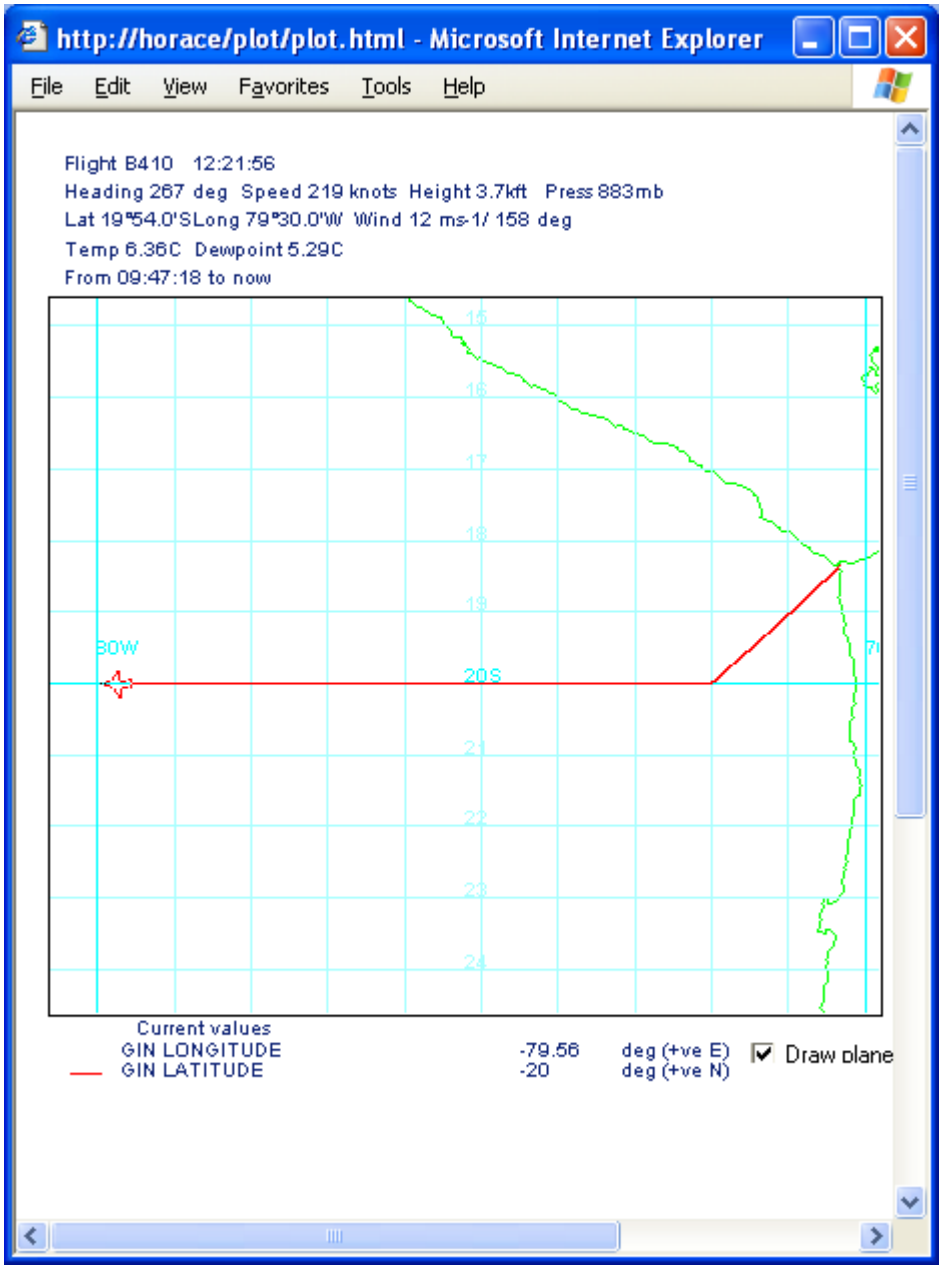


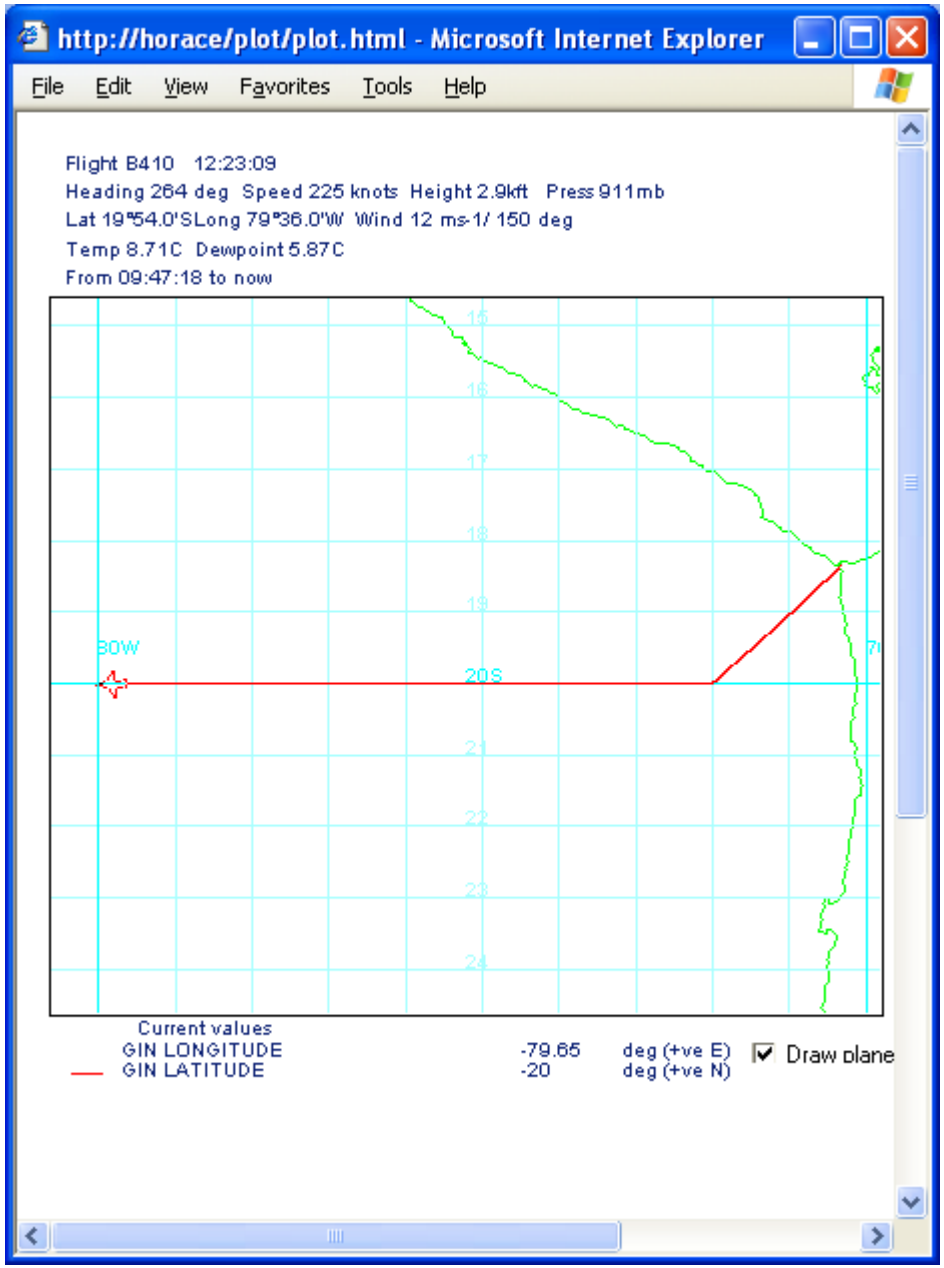
P12 end 50ft, P13 start

P13 end start R4.1



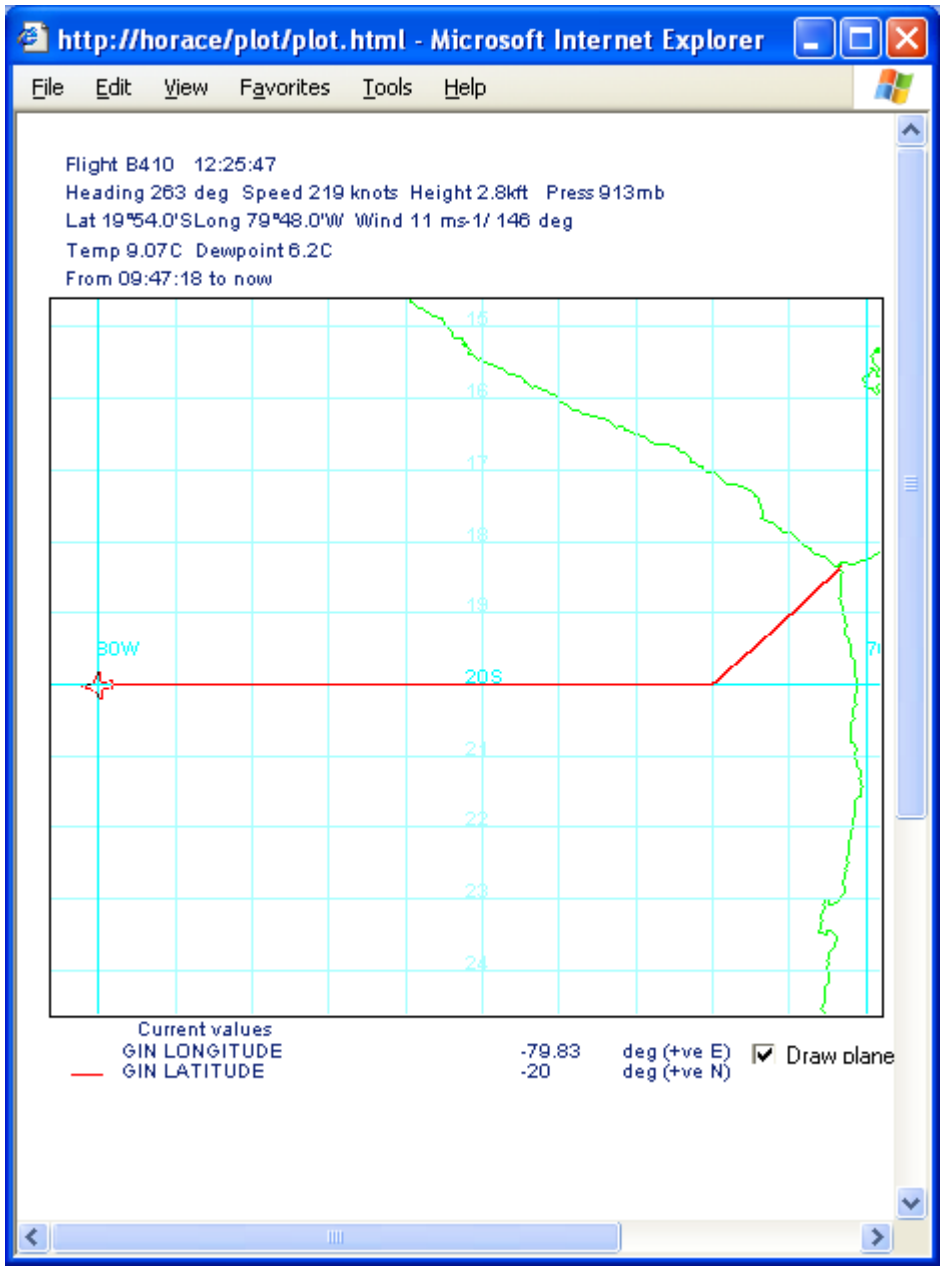
R4.1 end P14 start to 3900ft where cloud would have been



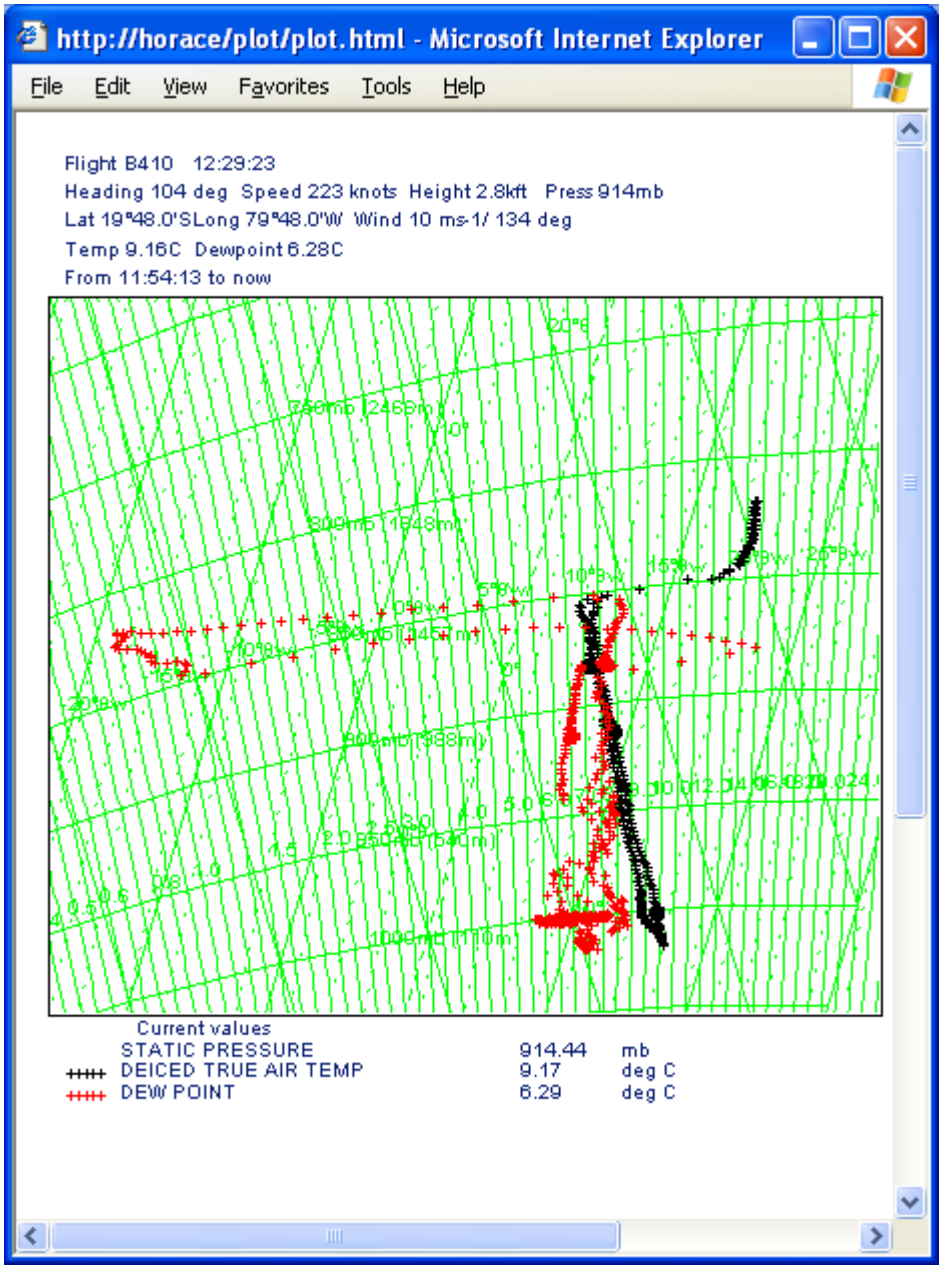


End P14 start R4.2 at 3900ft

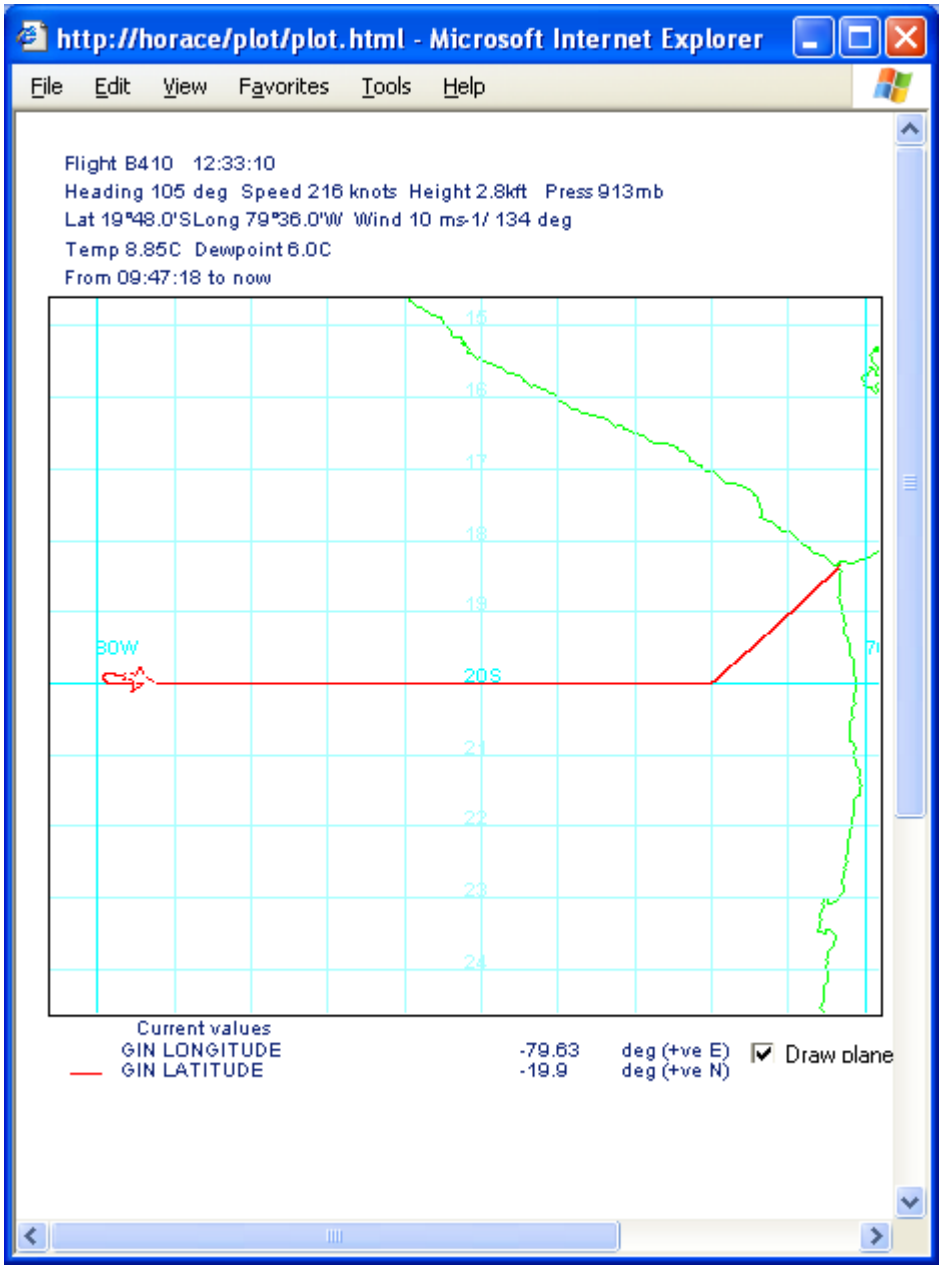
R 4.2 restart at 3000ft



Turning point - most W point 79deg 56

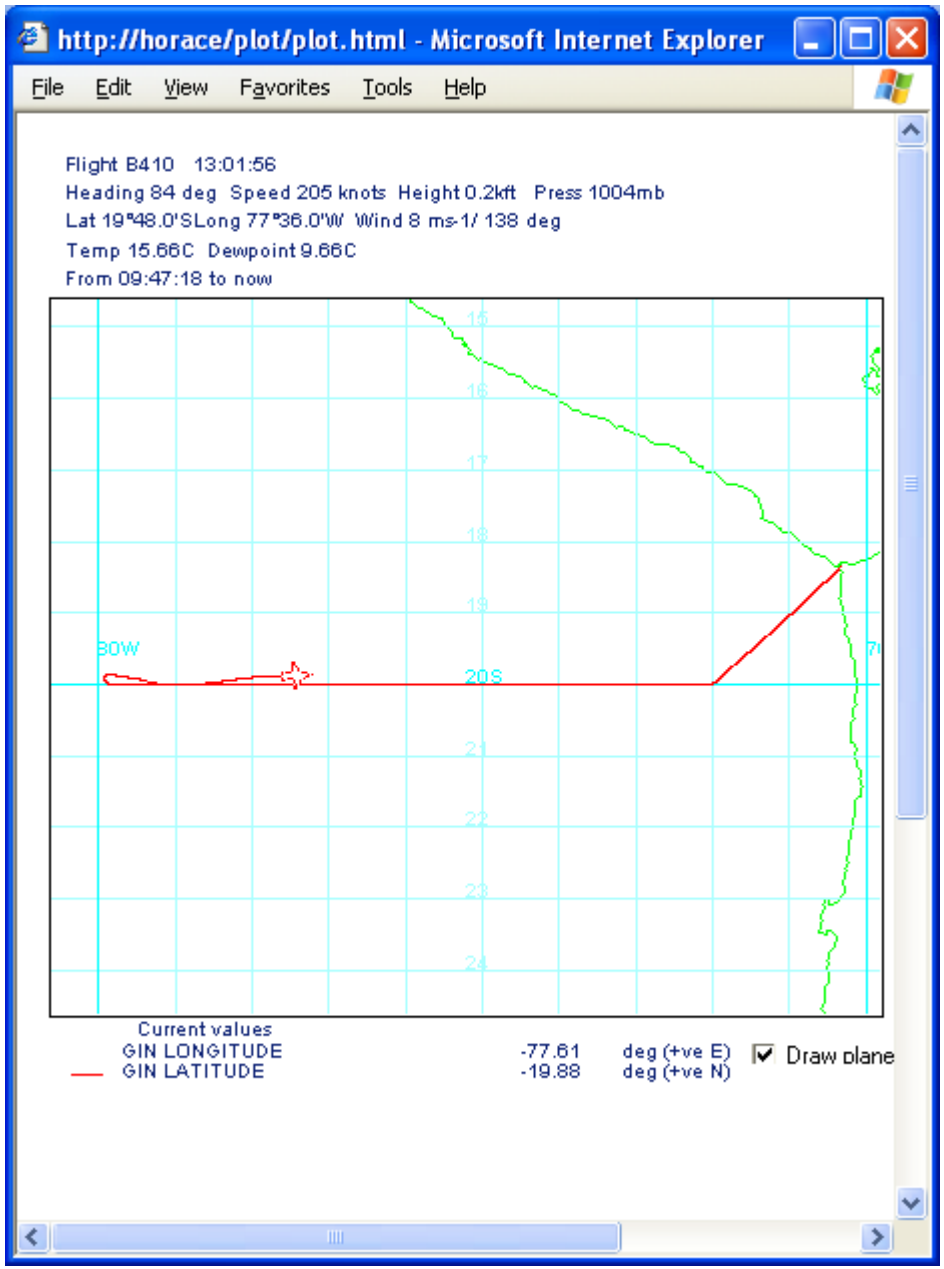


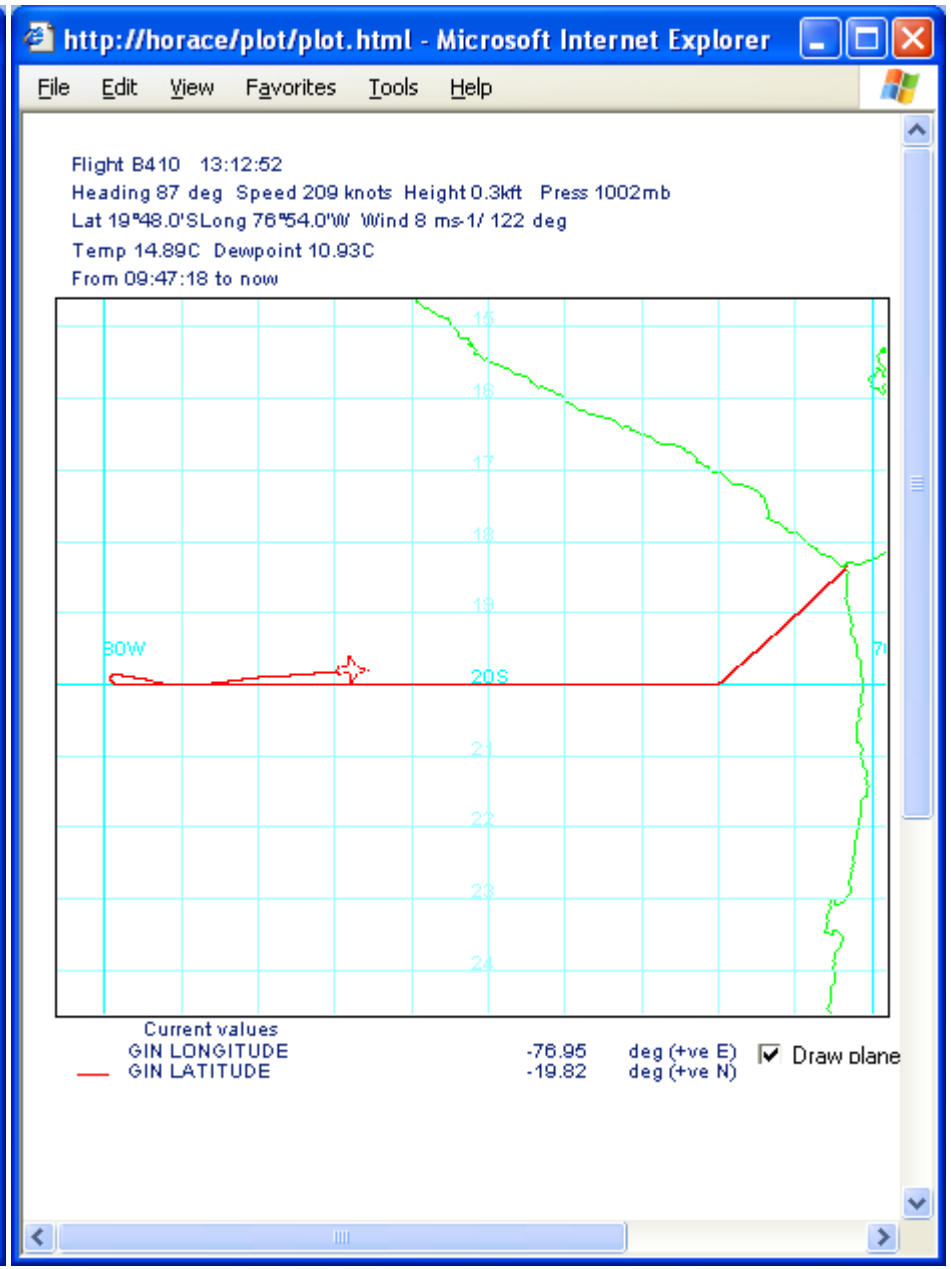
Popped through inv until dropped down



End R4.2 start P15 up to FL100

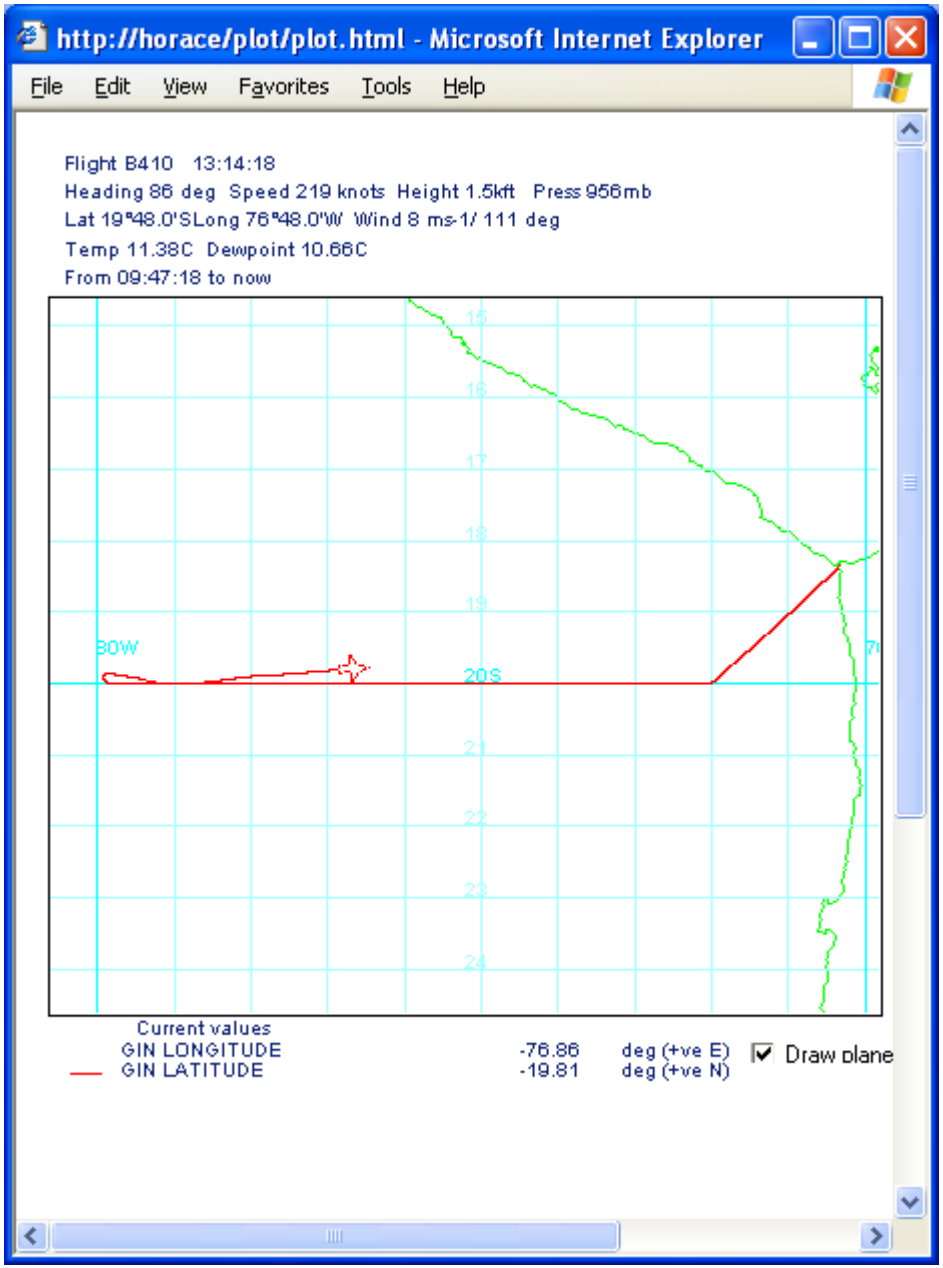
Powerpoint crashed – so lost screendumps from P15 end to P17

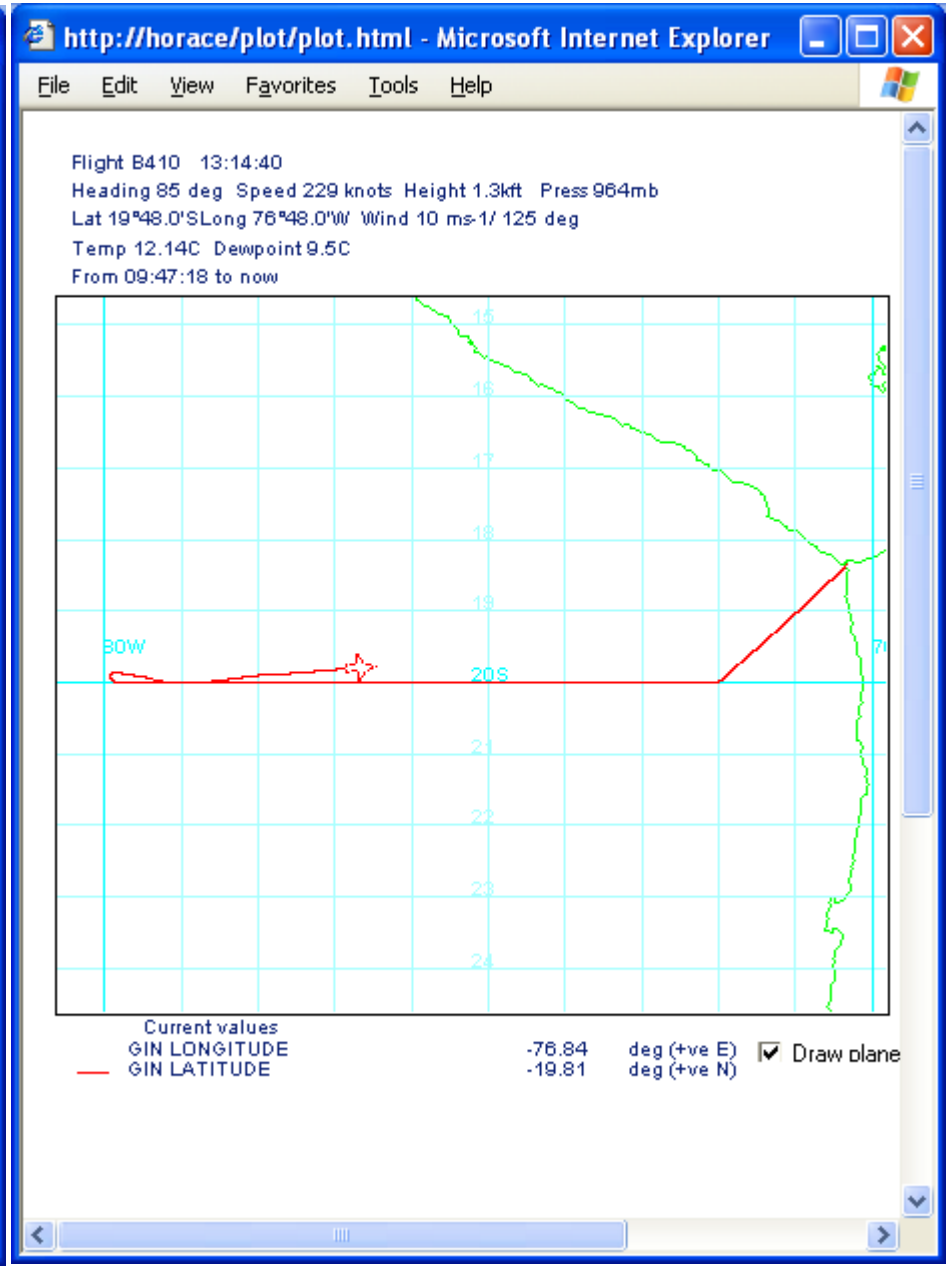




P17 end 500ft R5.1start

End R5.1 start P18





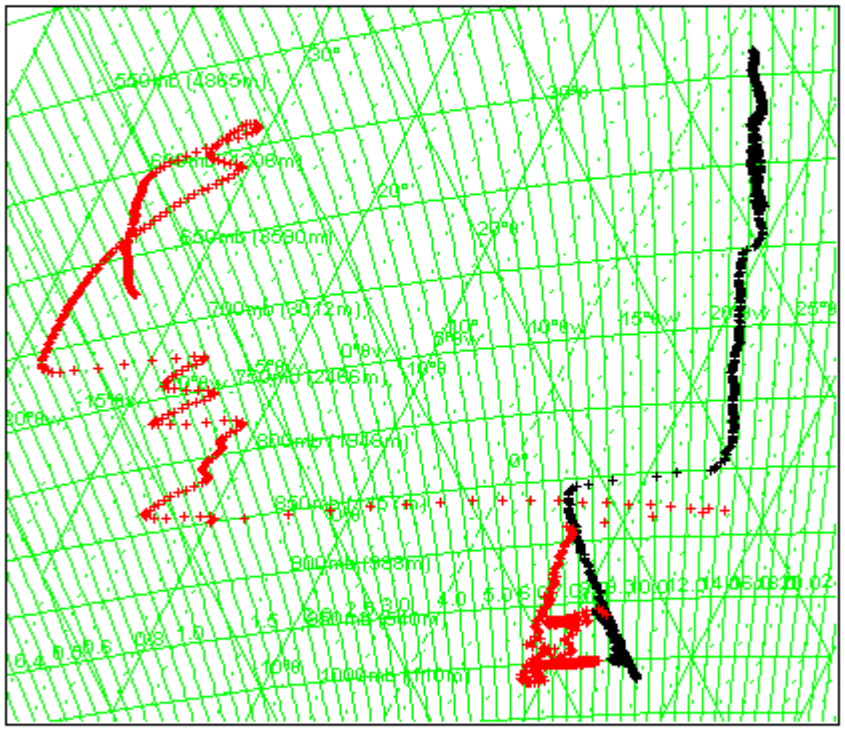
End P18 1800ft - too high

R5.2 start at 1500ft

http://horace/plot/plot.html - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Flight B410 13:21:52
Heading 87 deg Speed 212 knots Height 1.3kft Press 964mb
Lat 19°42.0'S Long 76°24.0'W Wind 11 ms-1/ 127 deg
Temp 12.51C Dewpoint 8.2C
From 12:41:32 to now



Current values

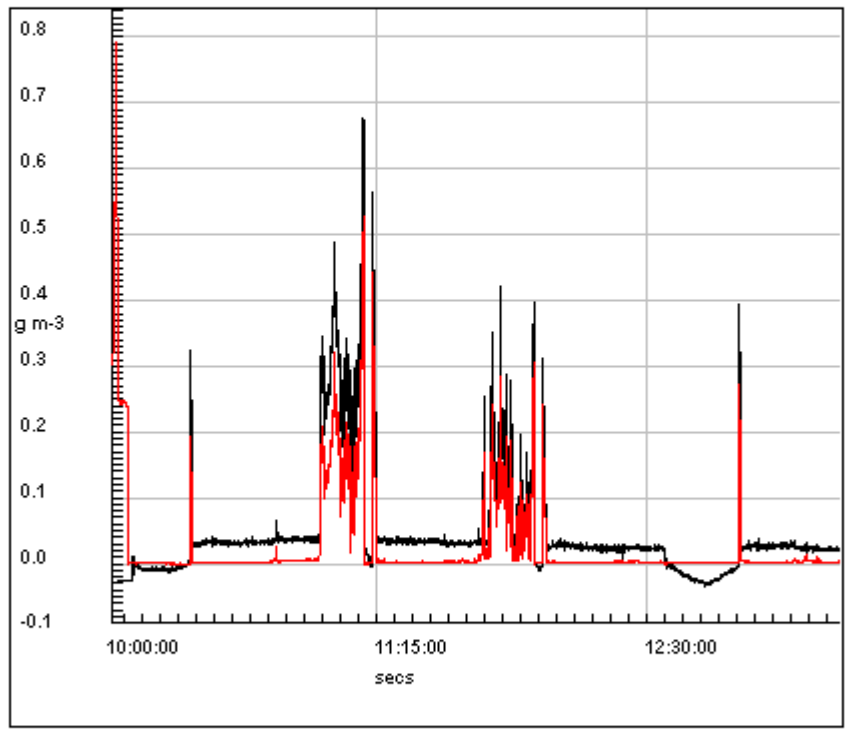
STATIC PRESSURE	964.05	mb
DEICED TRUE AIR TEMP	12.52	deg C
DEW POINT	8.2	deg C

http://horace/plot/plot.html - Microsoft Internet Explorer

File Edit View Favorites Tools Help

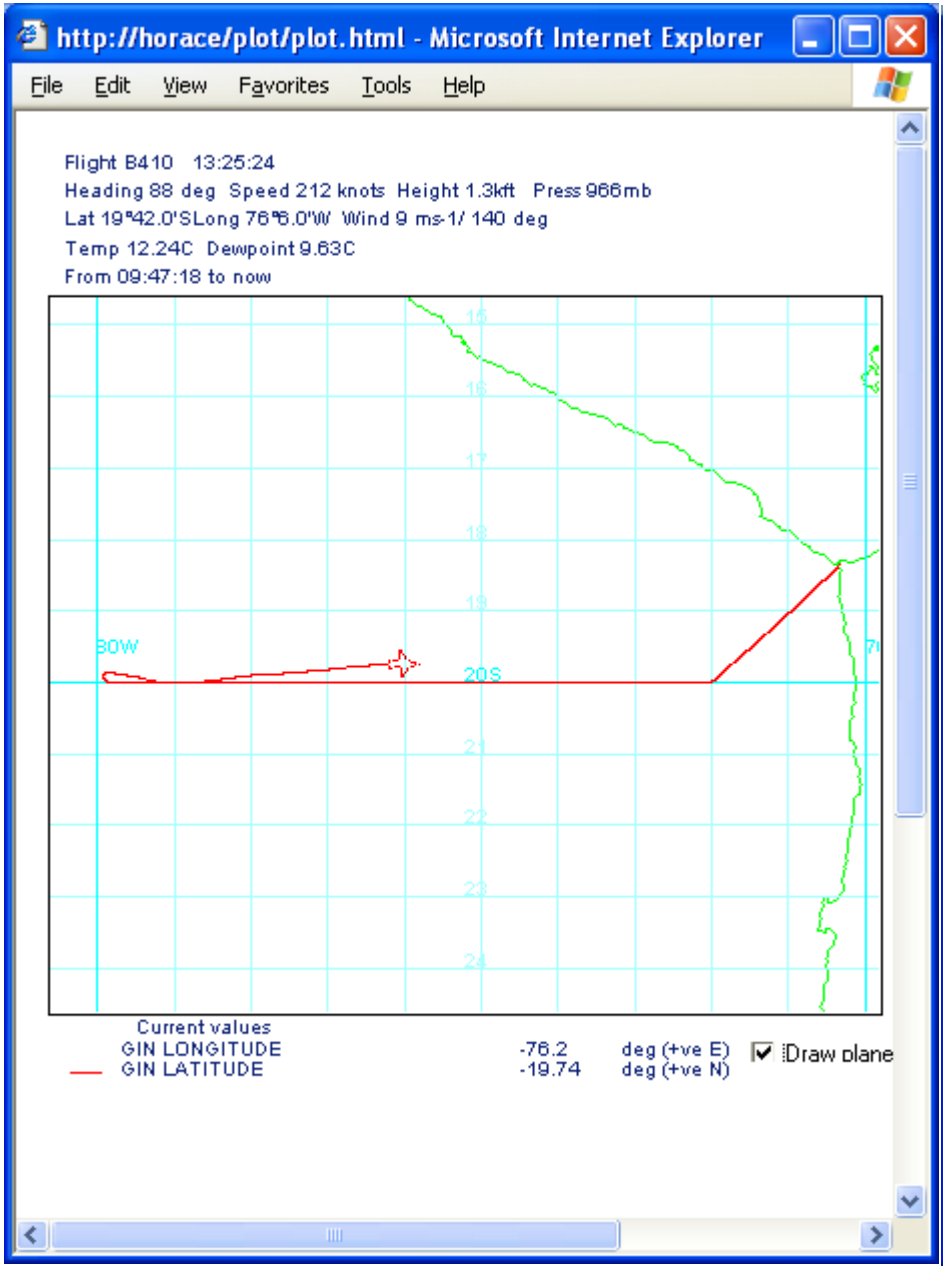
New plot, same times

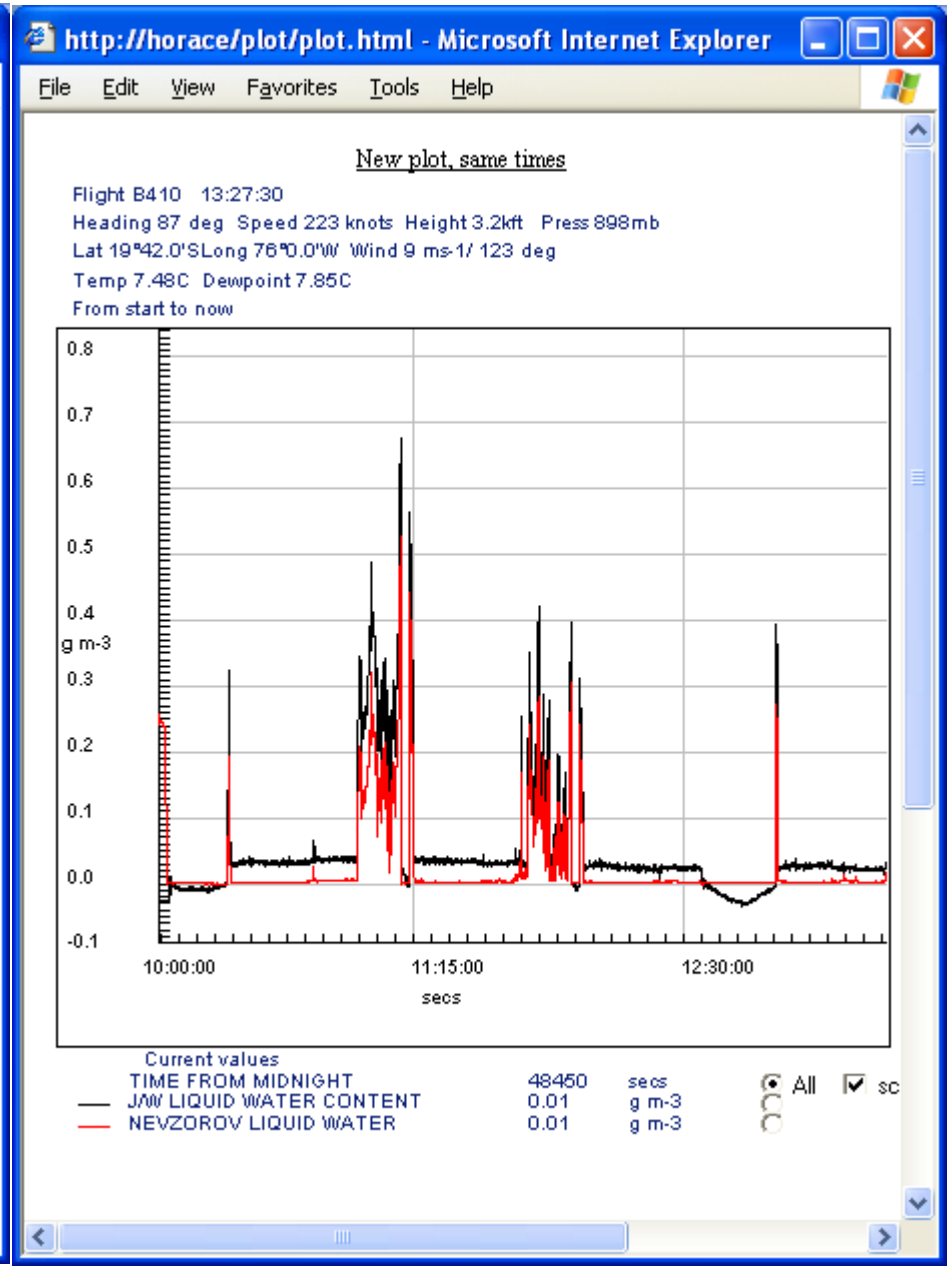
Flight B410 13:24:41
Heading 88 deg Speed 213 knots Height 1.3kft Press 963mb
Lat 19°42.0'S Long 76°12.0'W Wind 10 ms-1/ 132 deg
Temp 12.04C Dewpoint 9.52C
From start to now



Current values

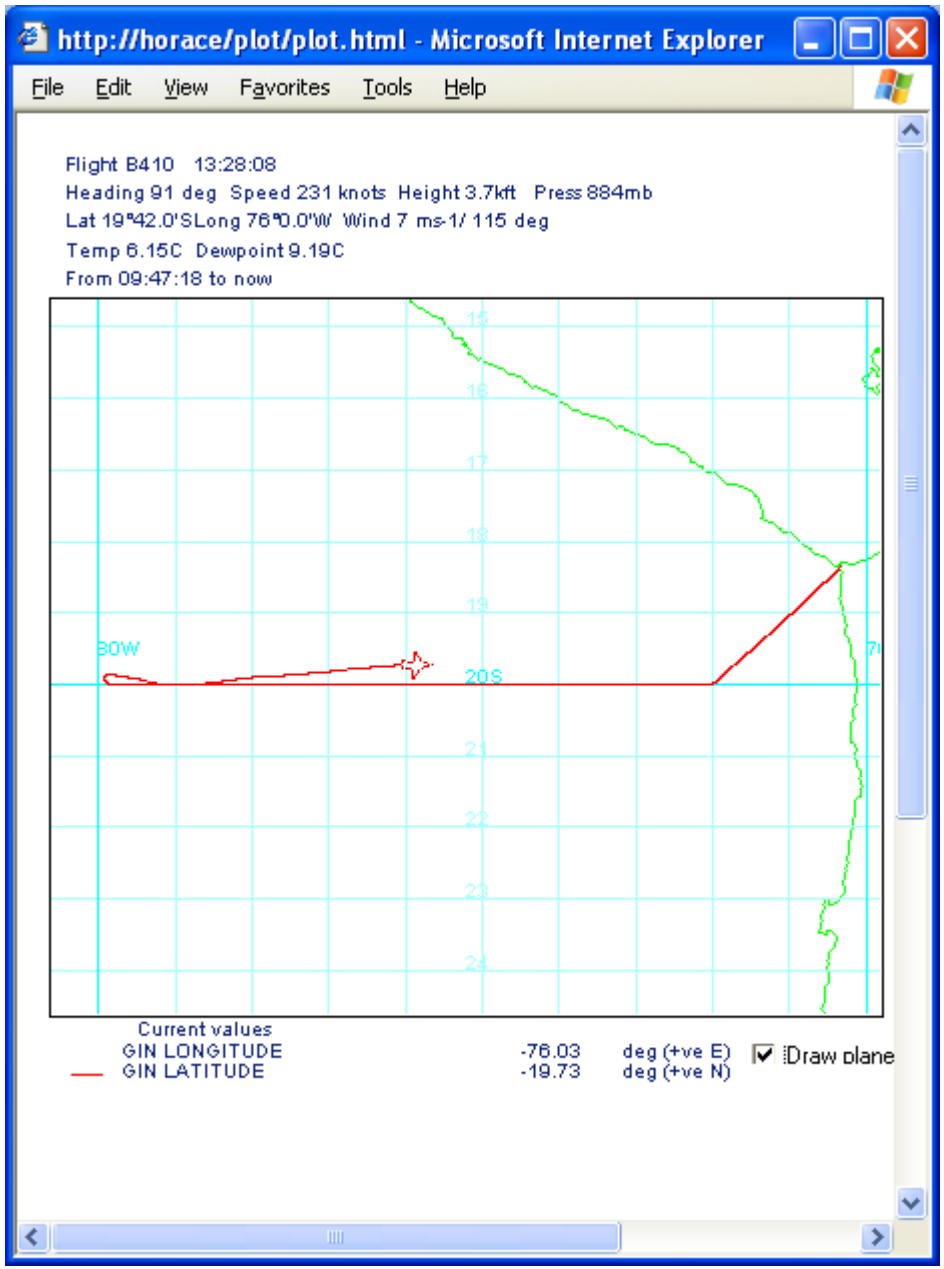
TIME FROM MIDNIGHT	48279	secs	
JAW LIQUID WATER CONTENT	0.02	g m-3	All sc
NEVZOROV LIQUID WATER	0	g m-3	



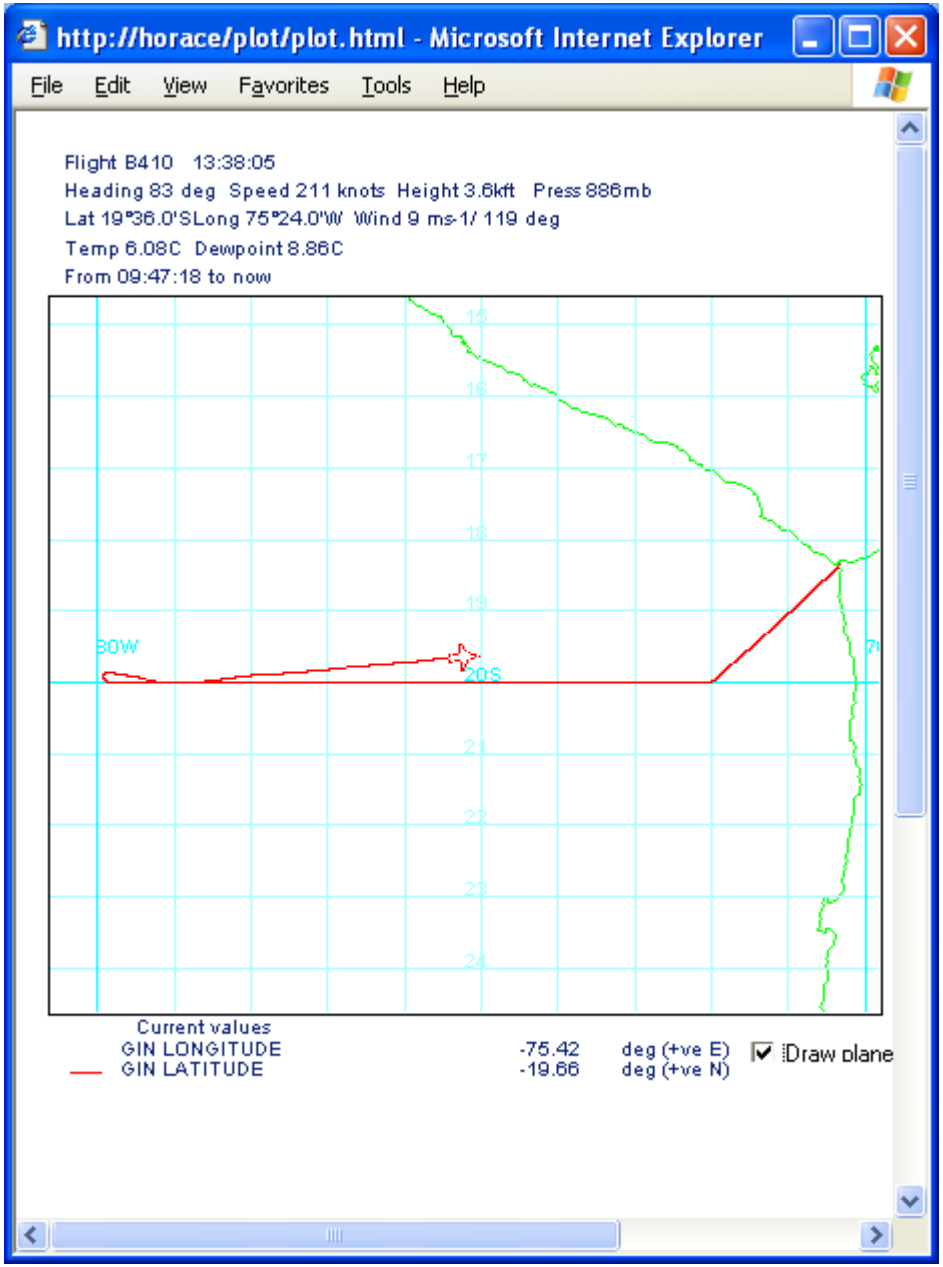


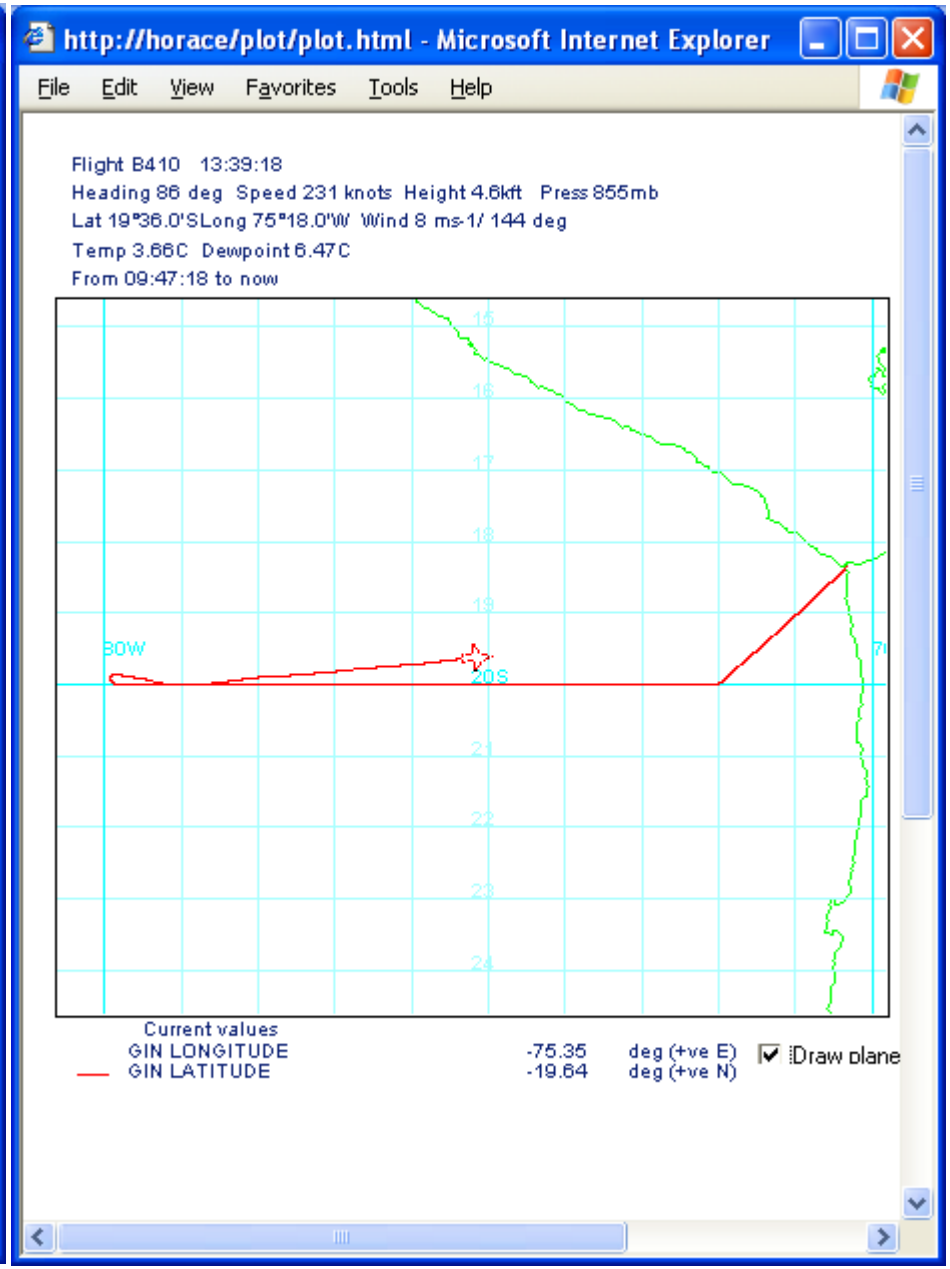
R5.2 end P19 start

CB 3500ft



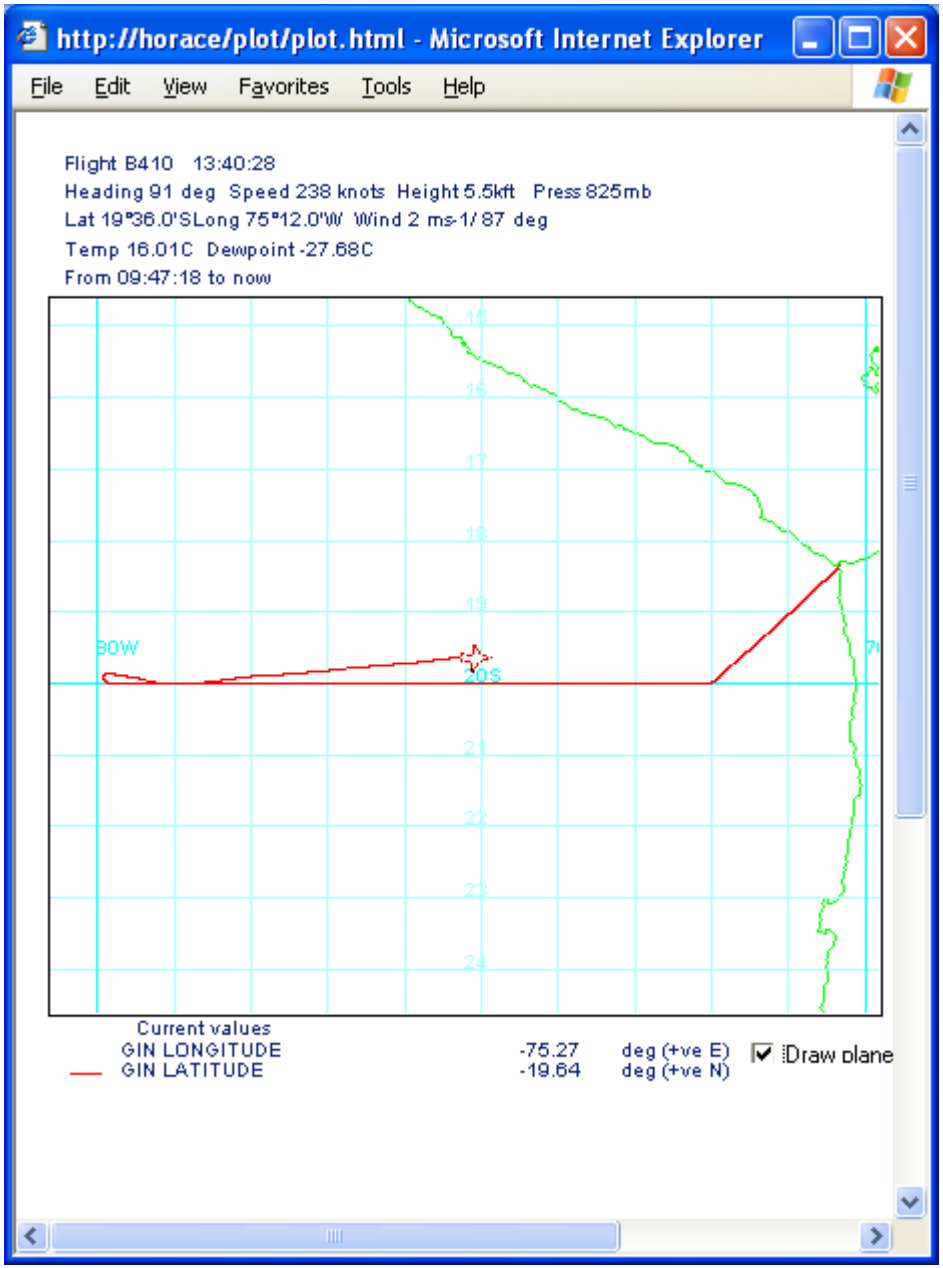
P19 end R5.3 started at 3800ft bumpy - near CT - do incloud run here to ensure in cloud over RHB

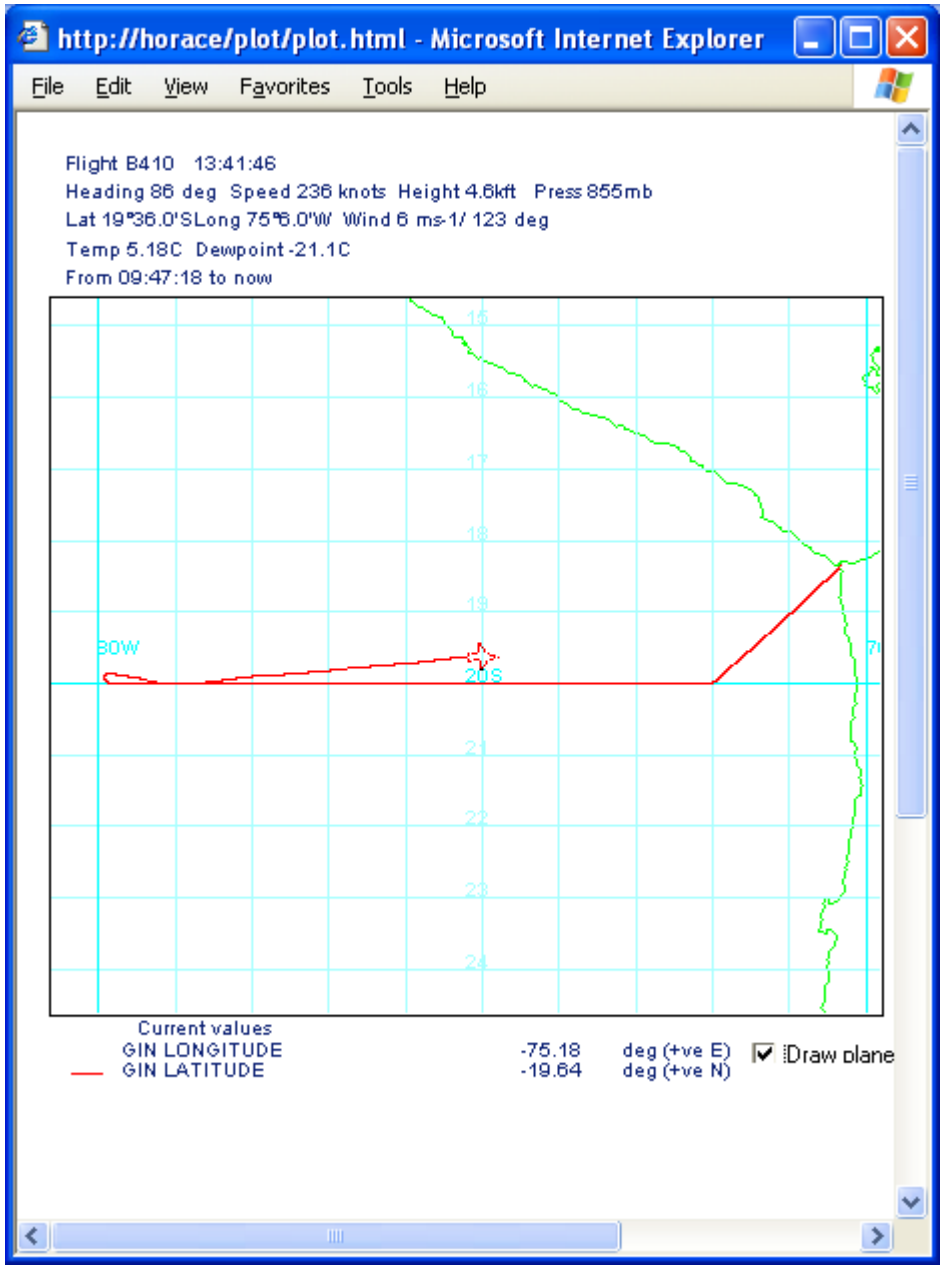




End R5.3, P20 start

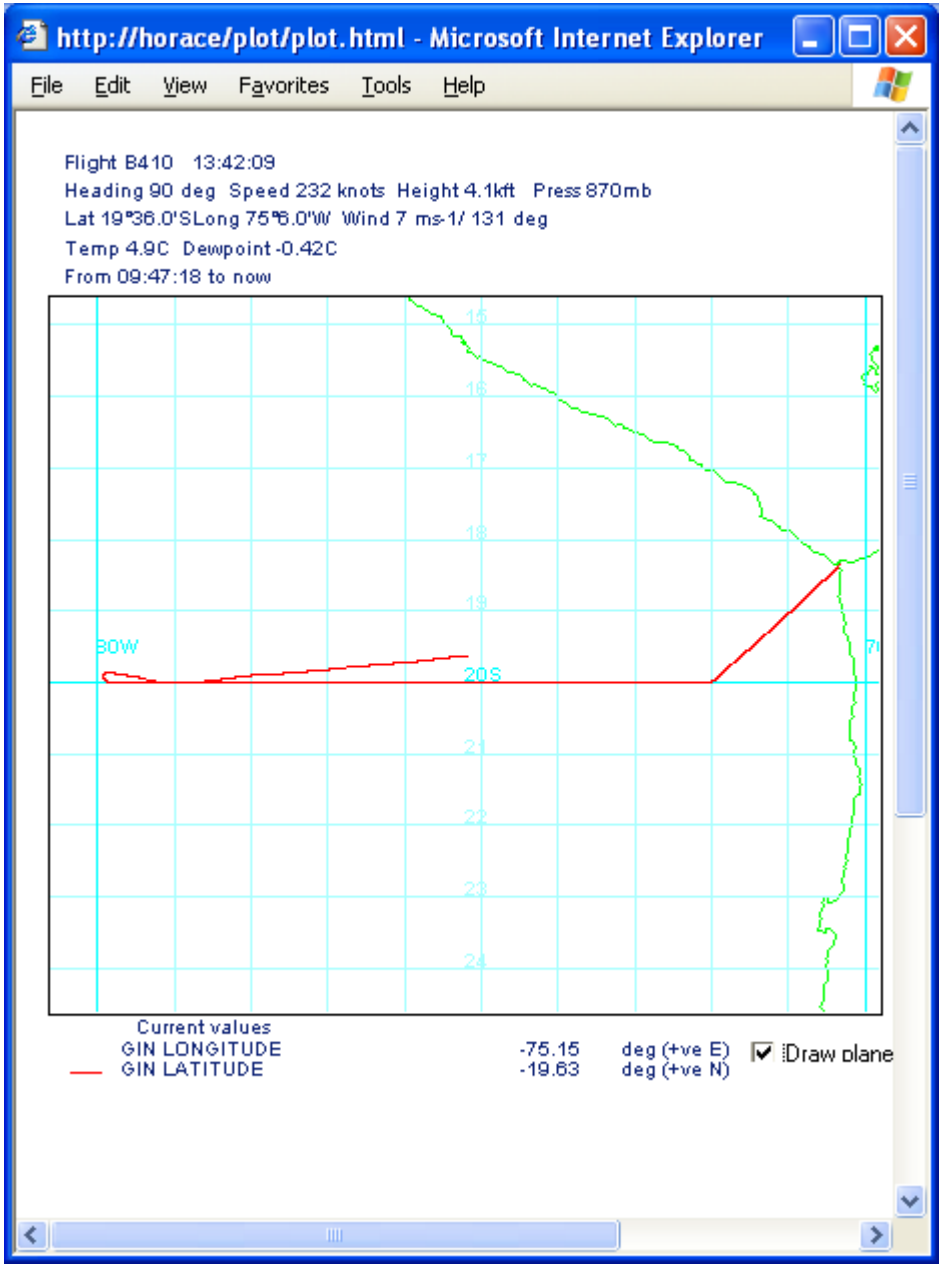
CT 4900ft P20

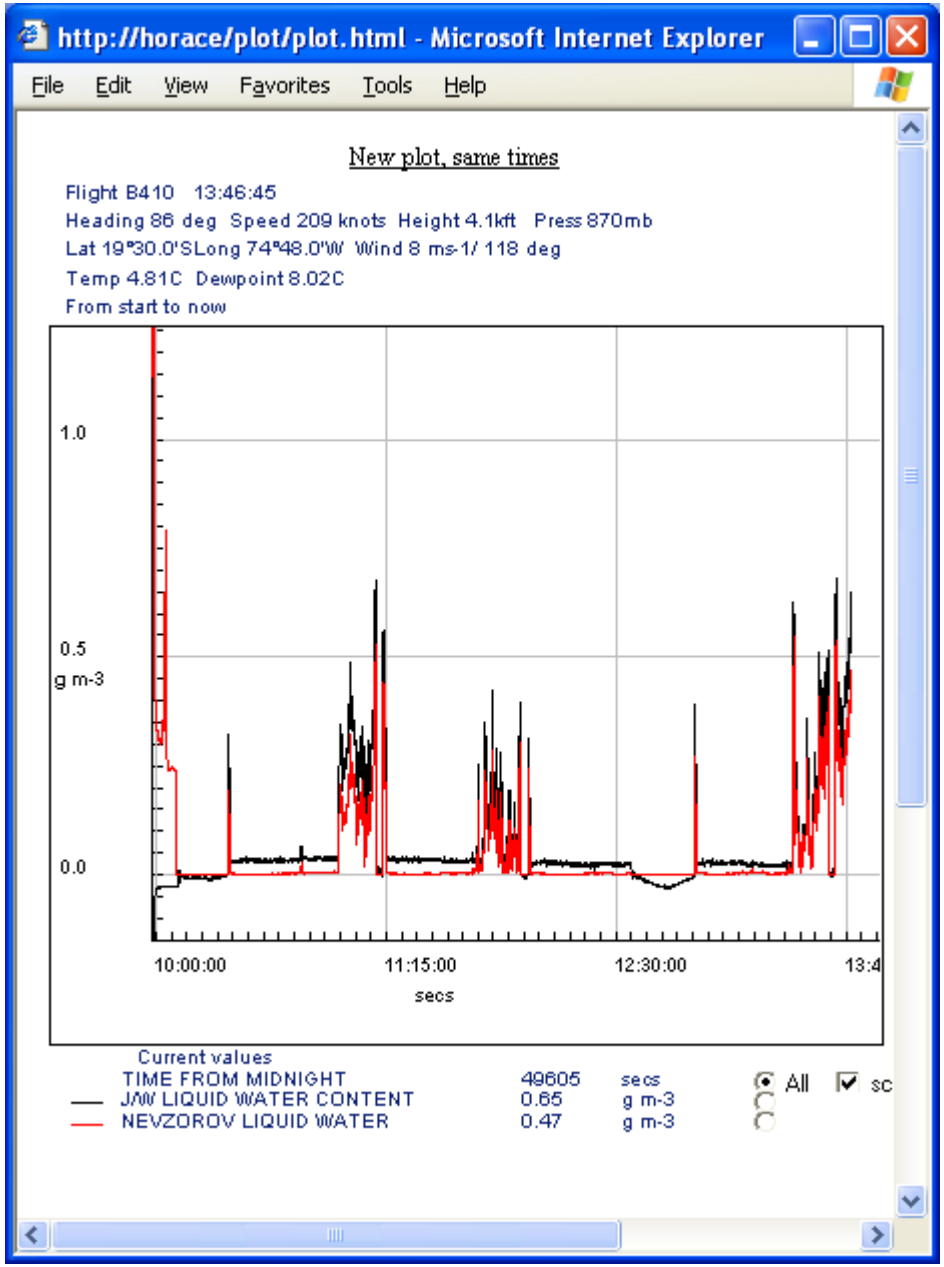




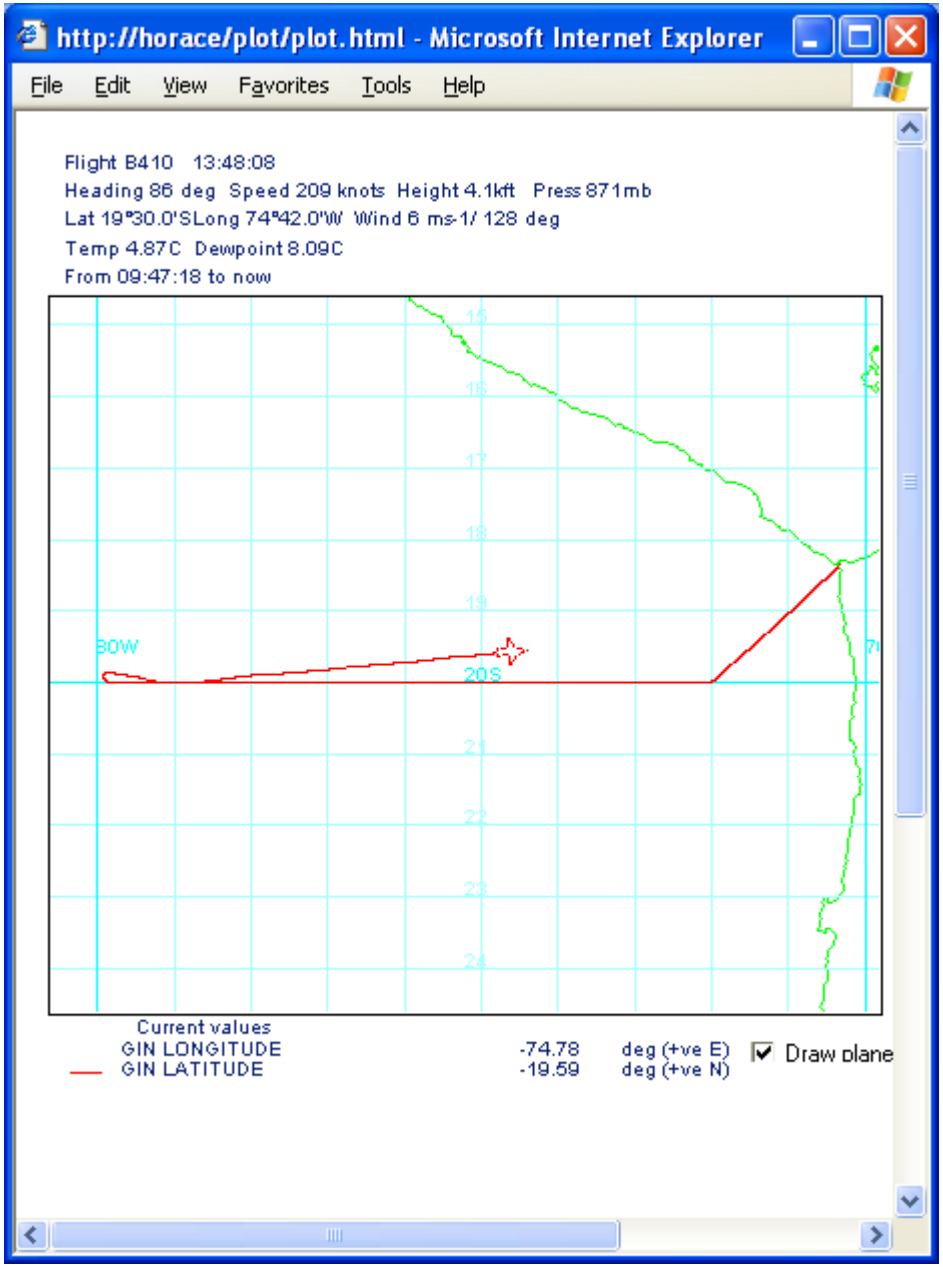
P20 end, P21 start from 5900ft

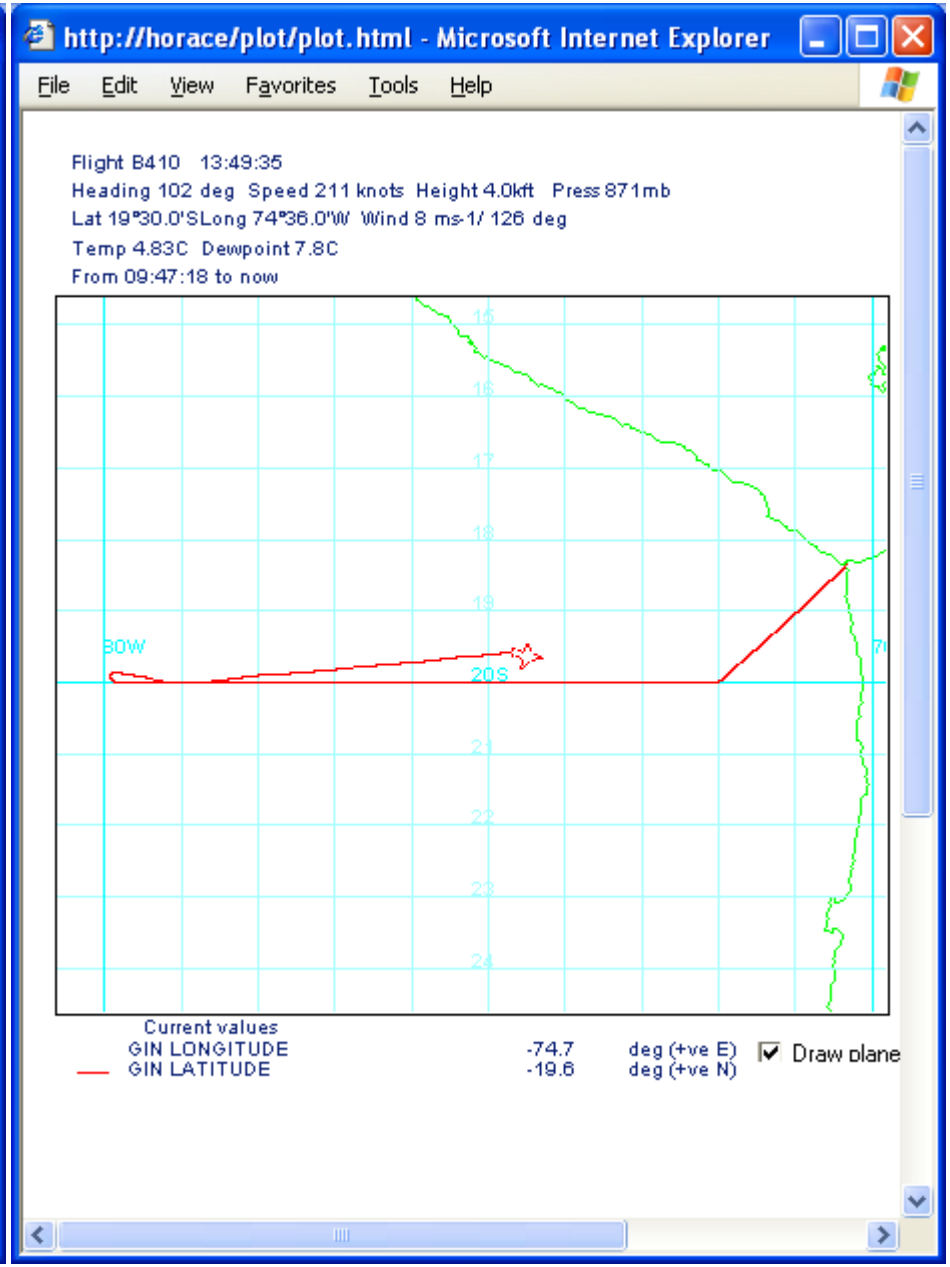
P21 CT 4900ft



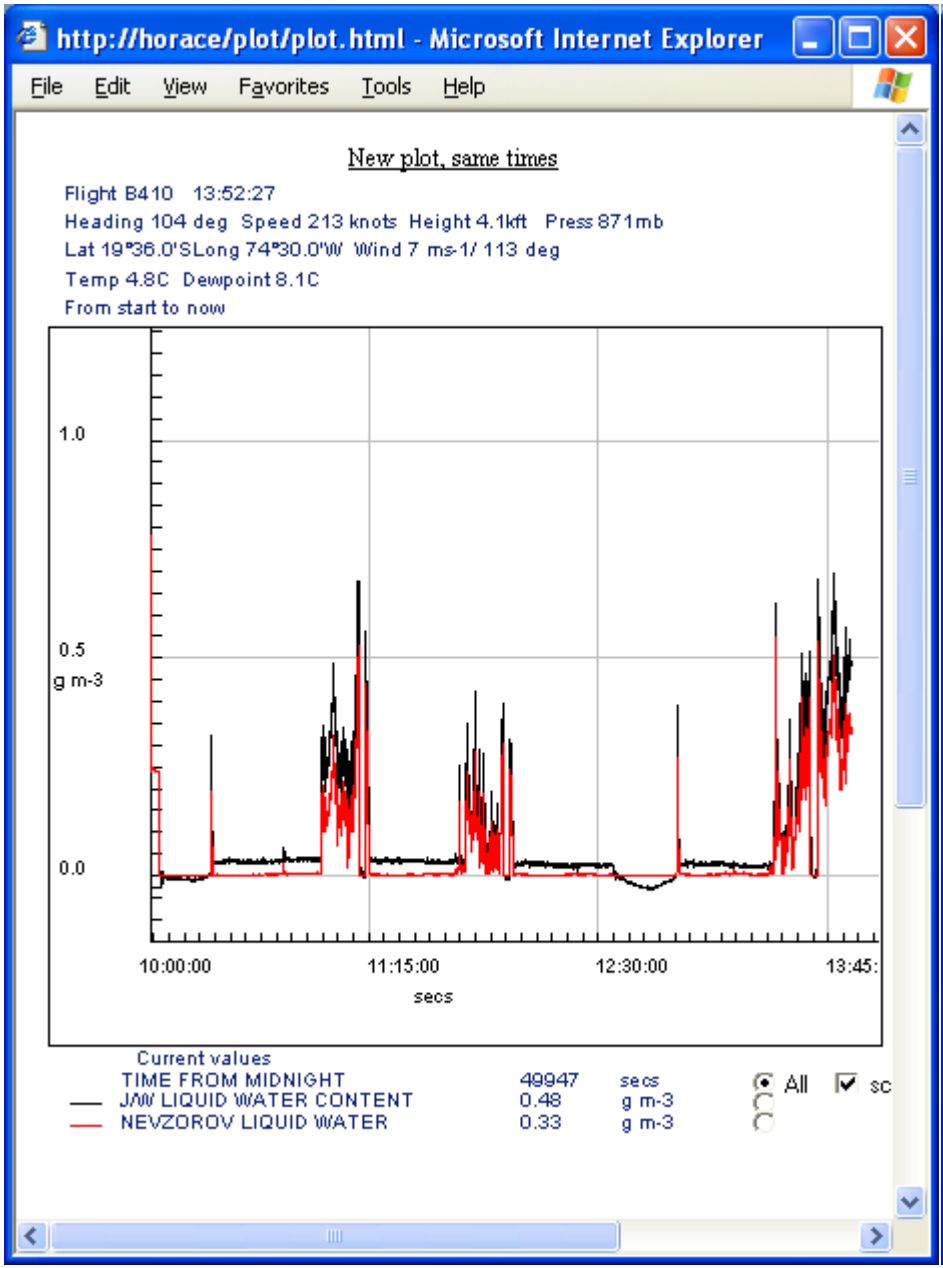


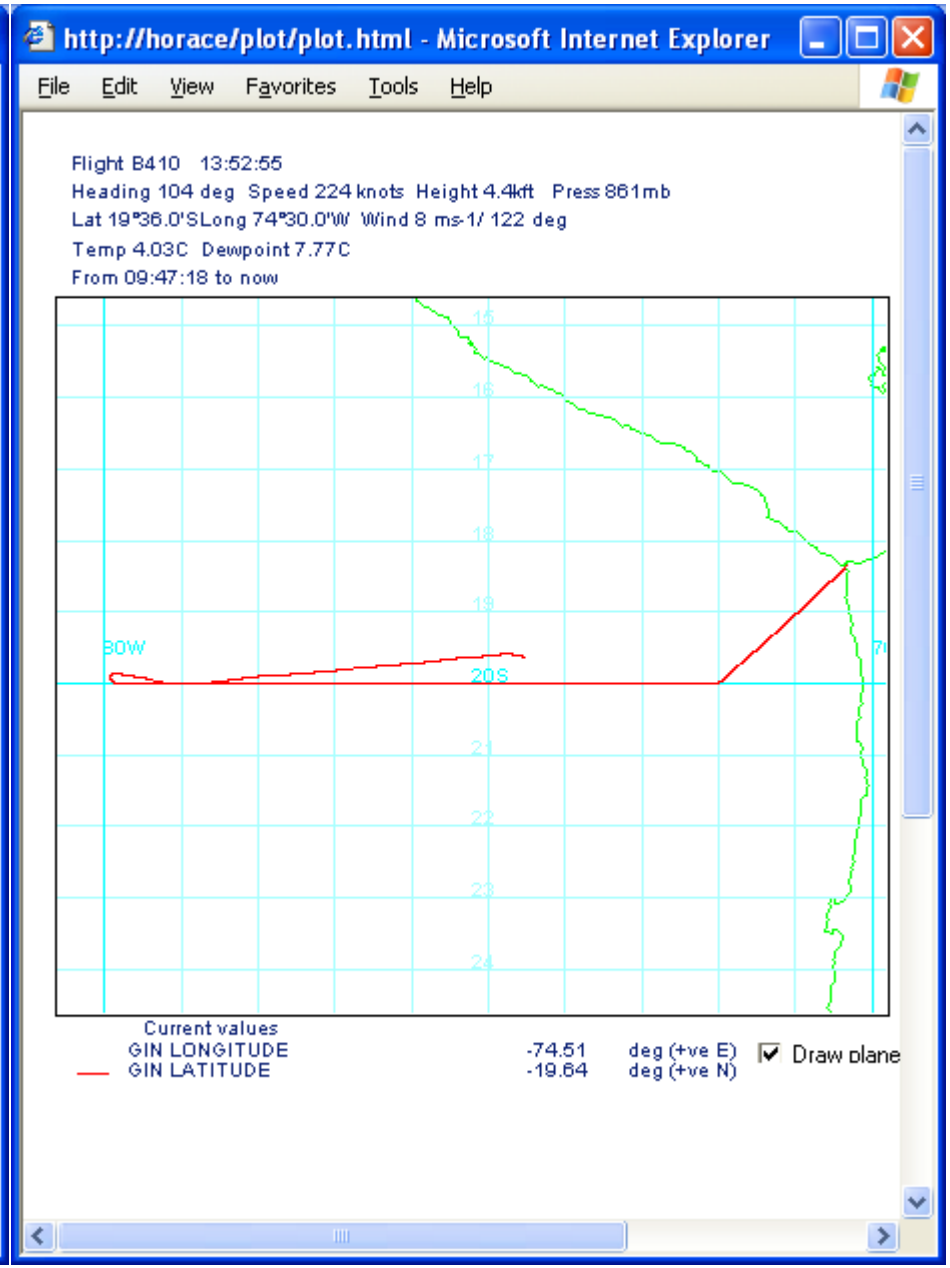
Start R5.4 incloud at 4300ft





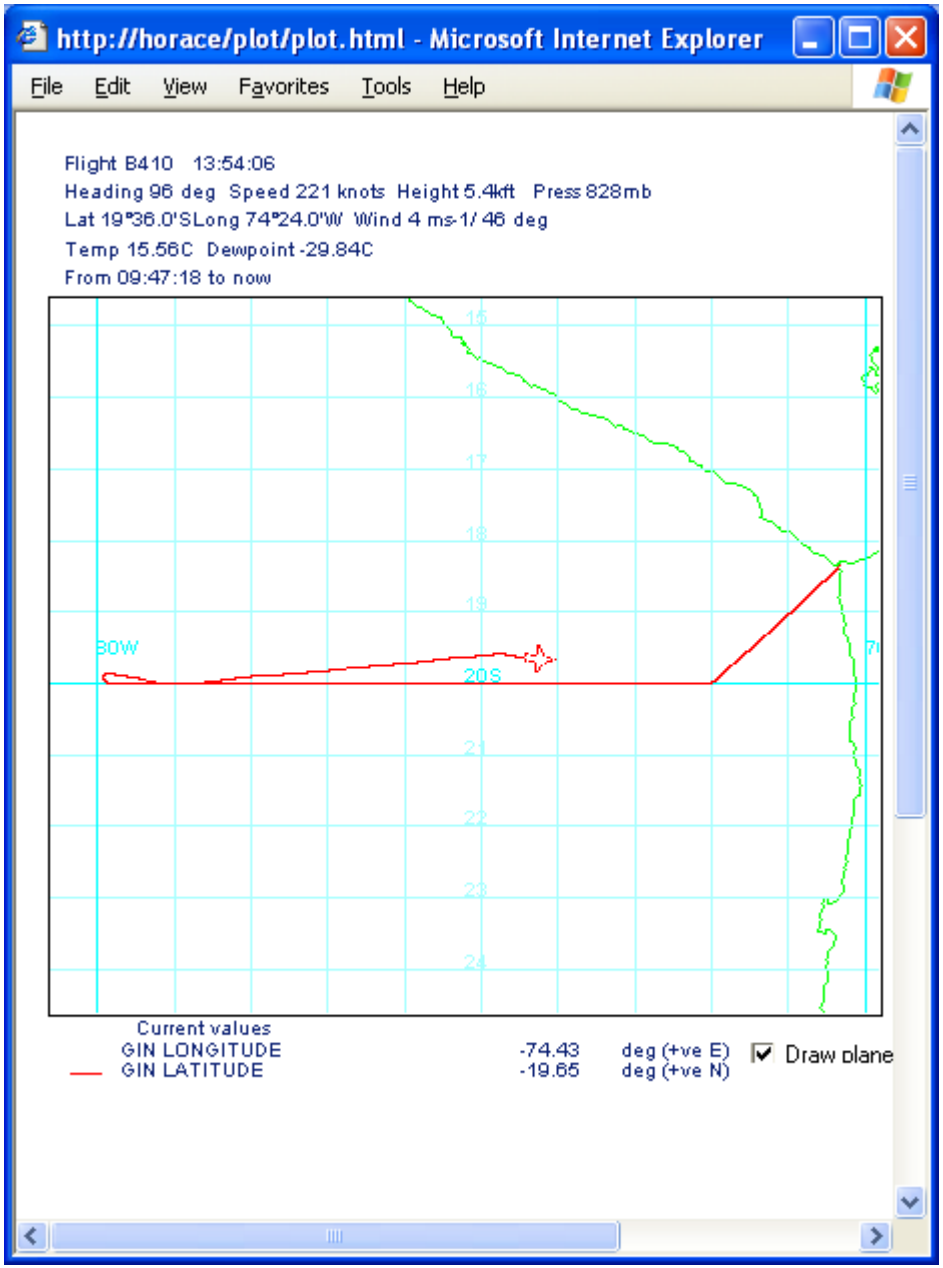
Overhead R H Brown

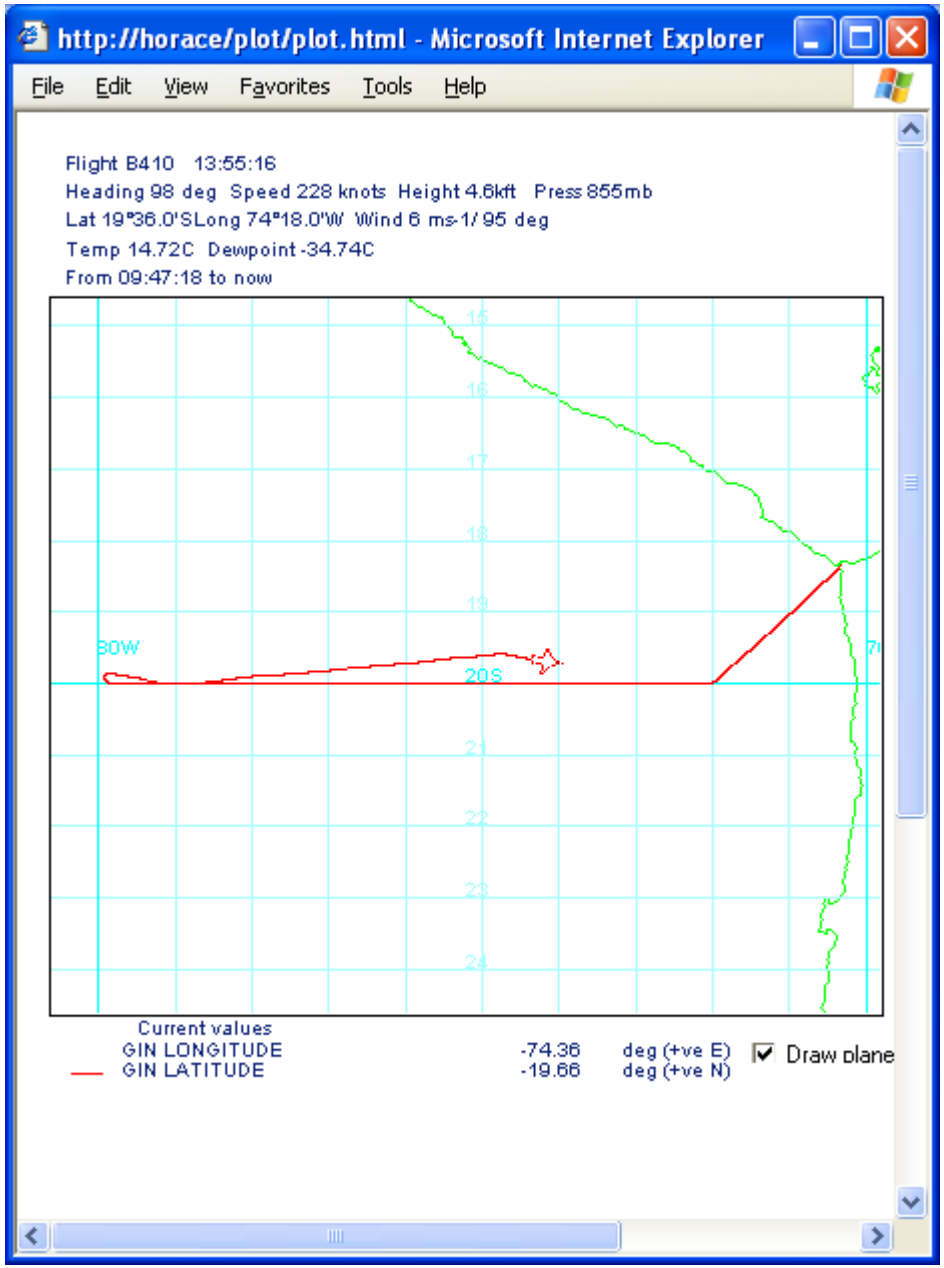




End R5.4 P22 start

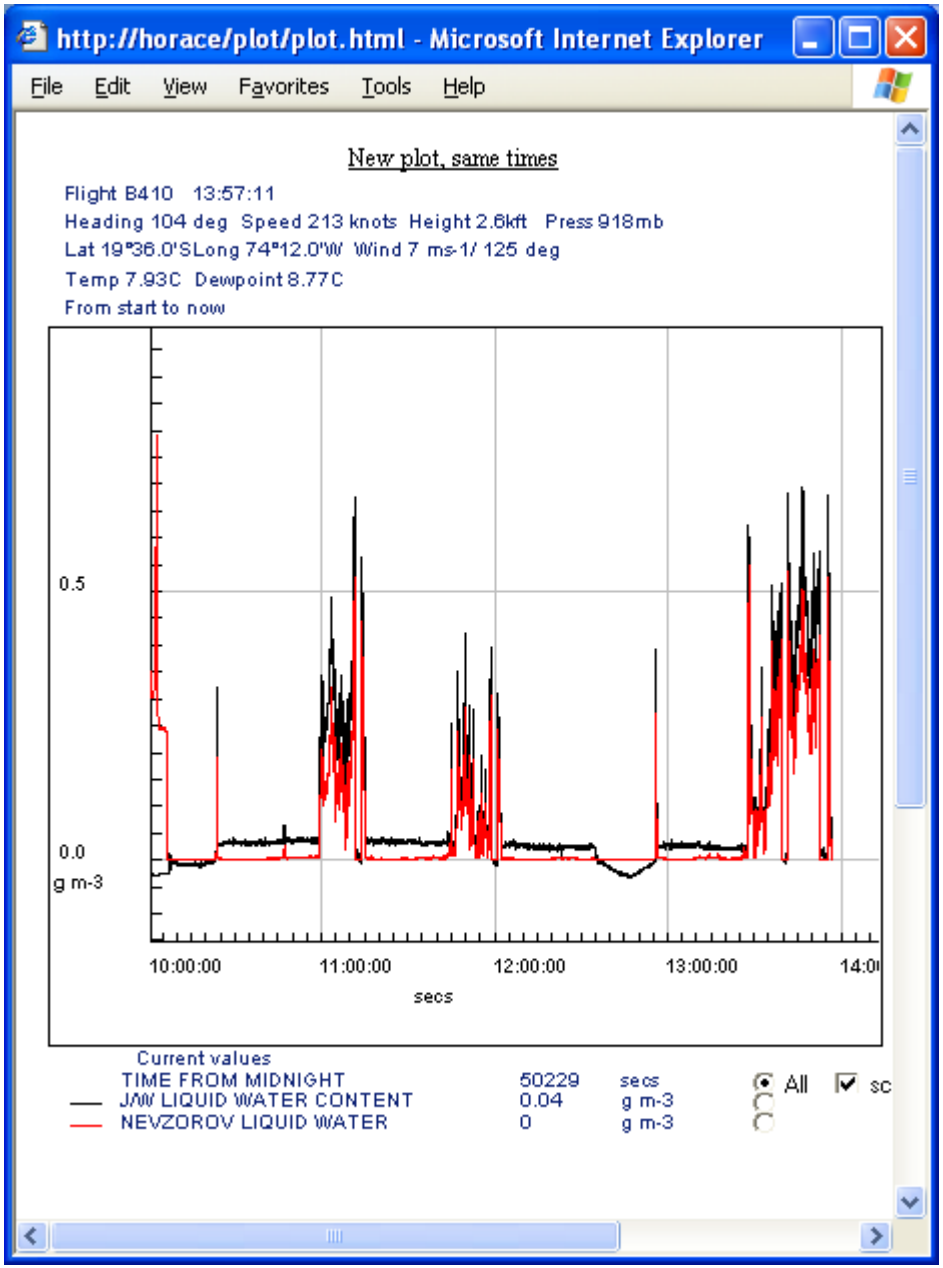
P22 CT 4700

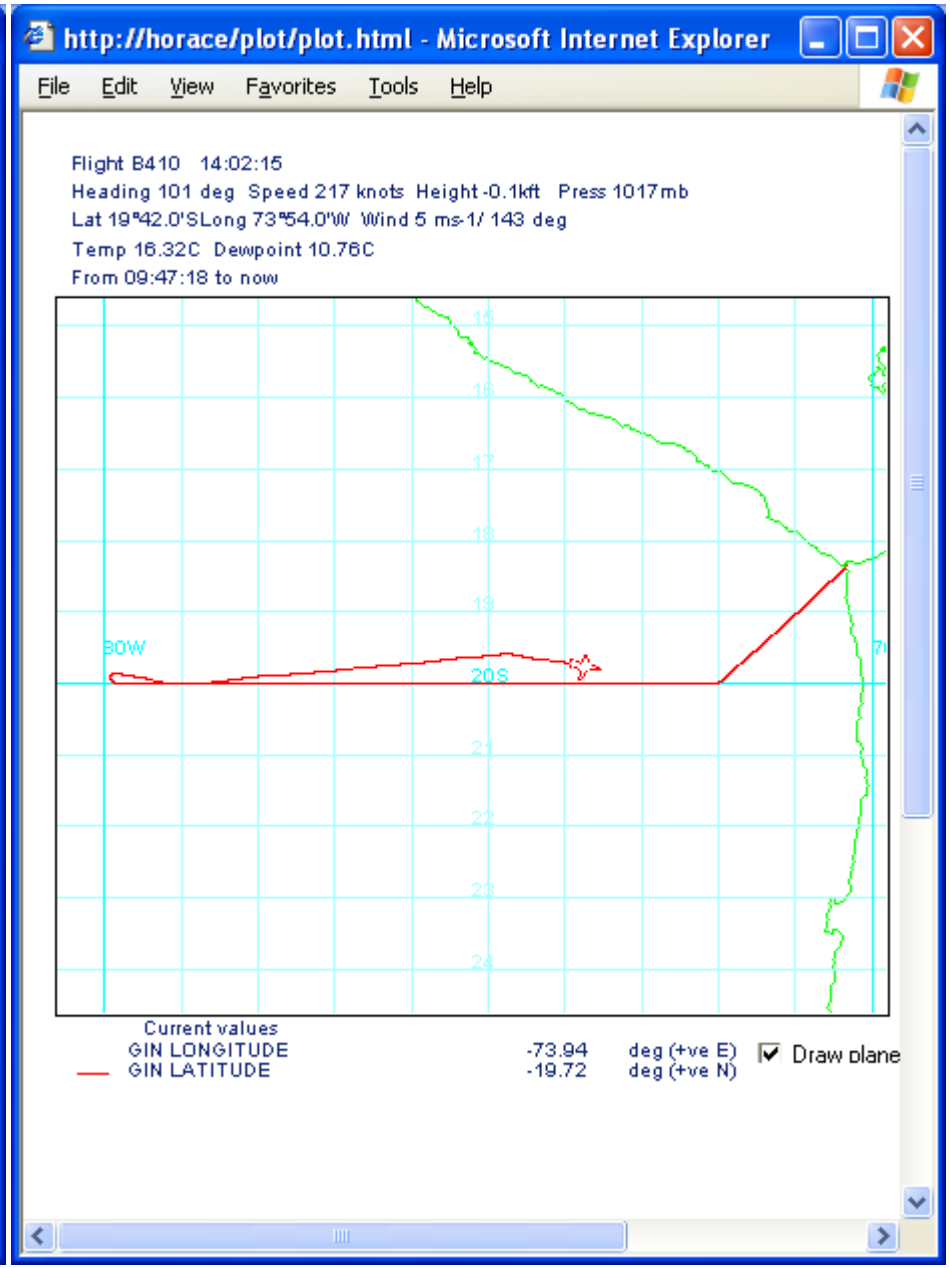




End P22, start P23 at 5700ft

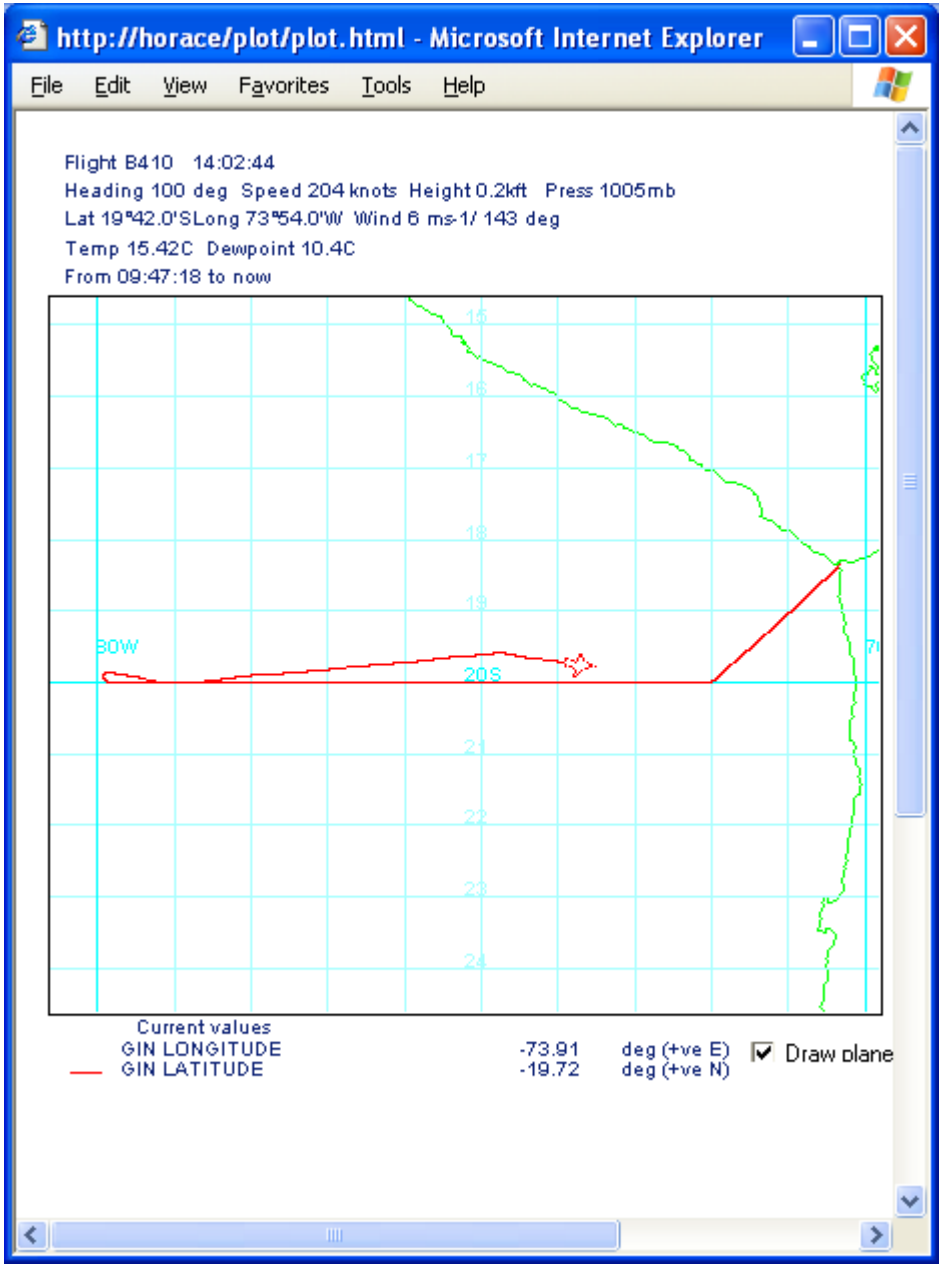
P23 CT at 4700ft

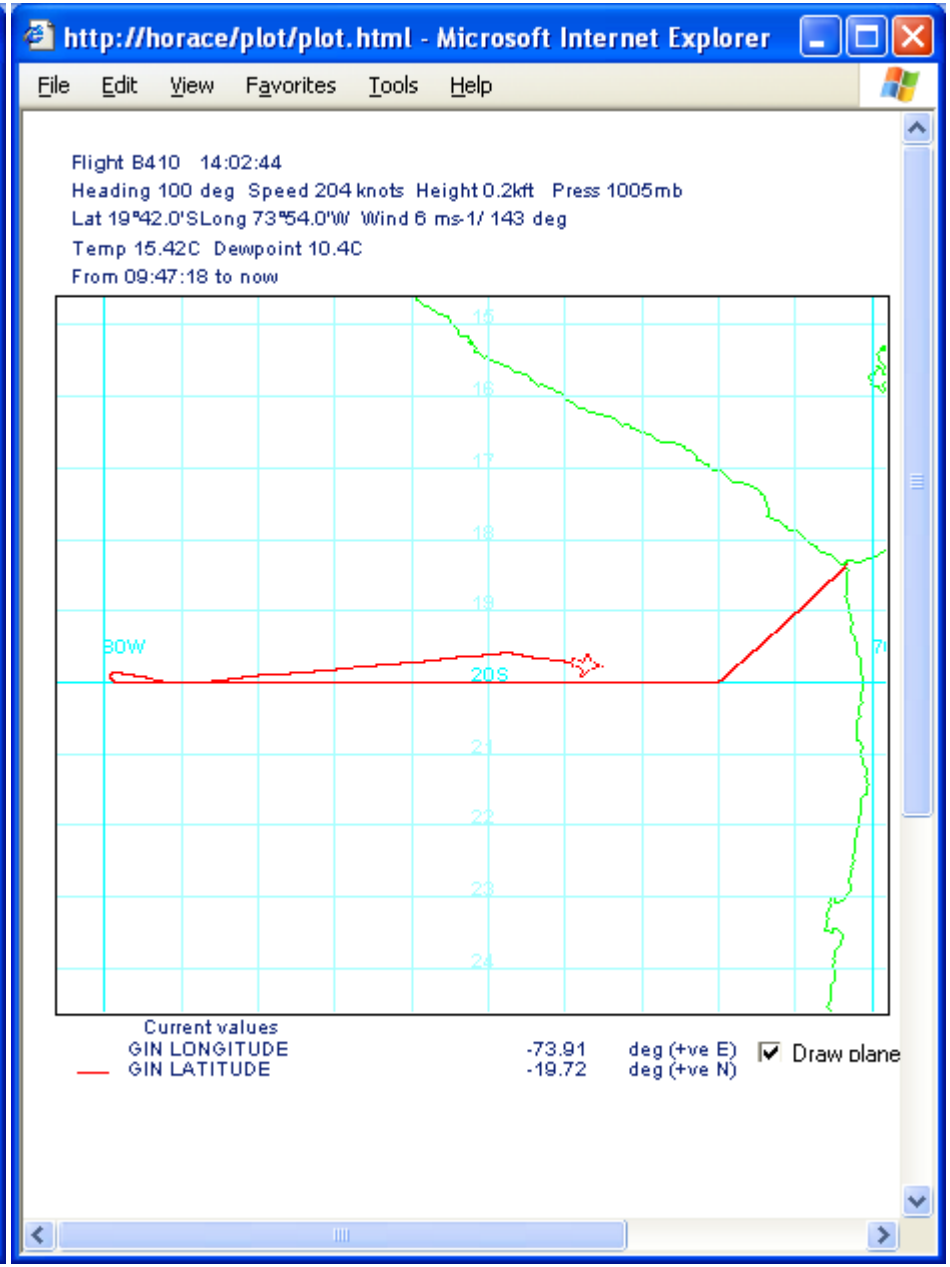




P23 CB about 2900ft

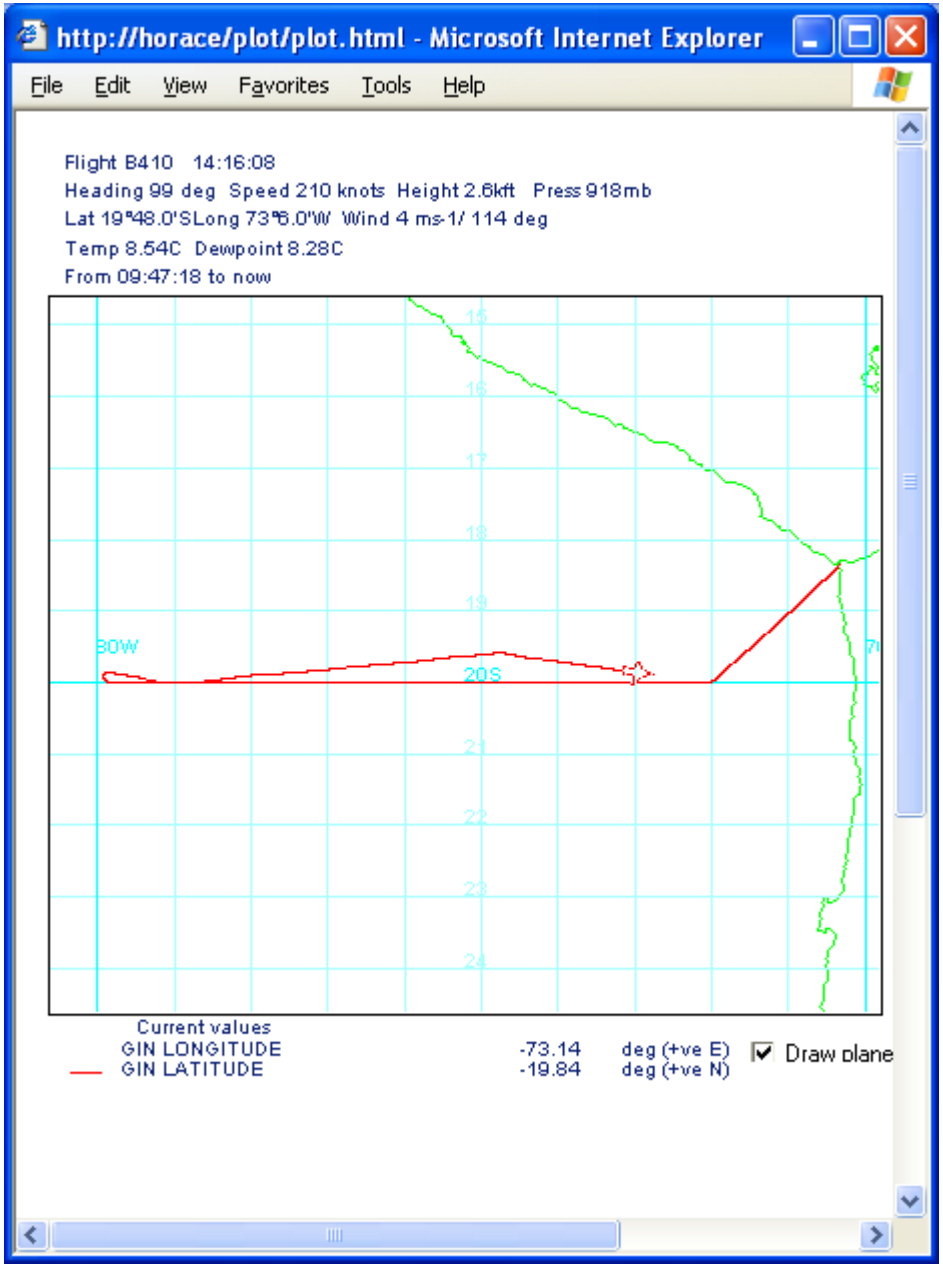
P23 end P24 start at 50ft

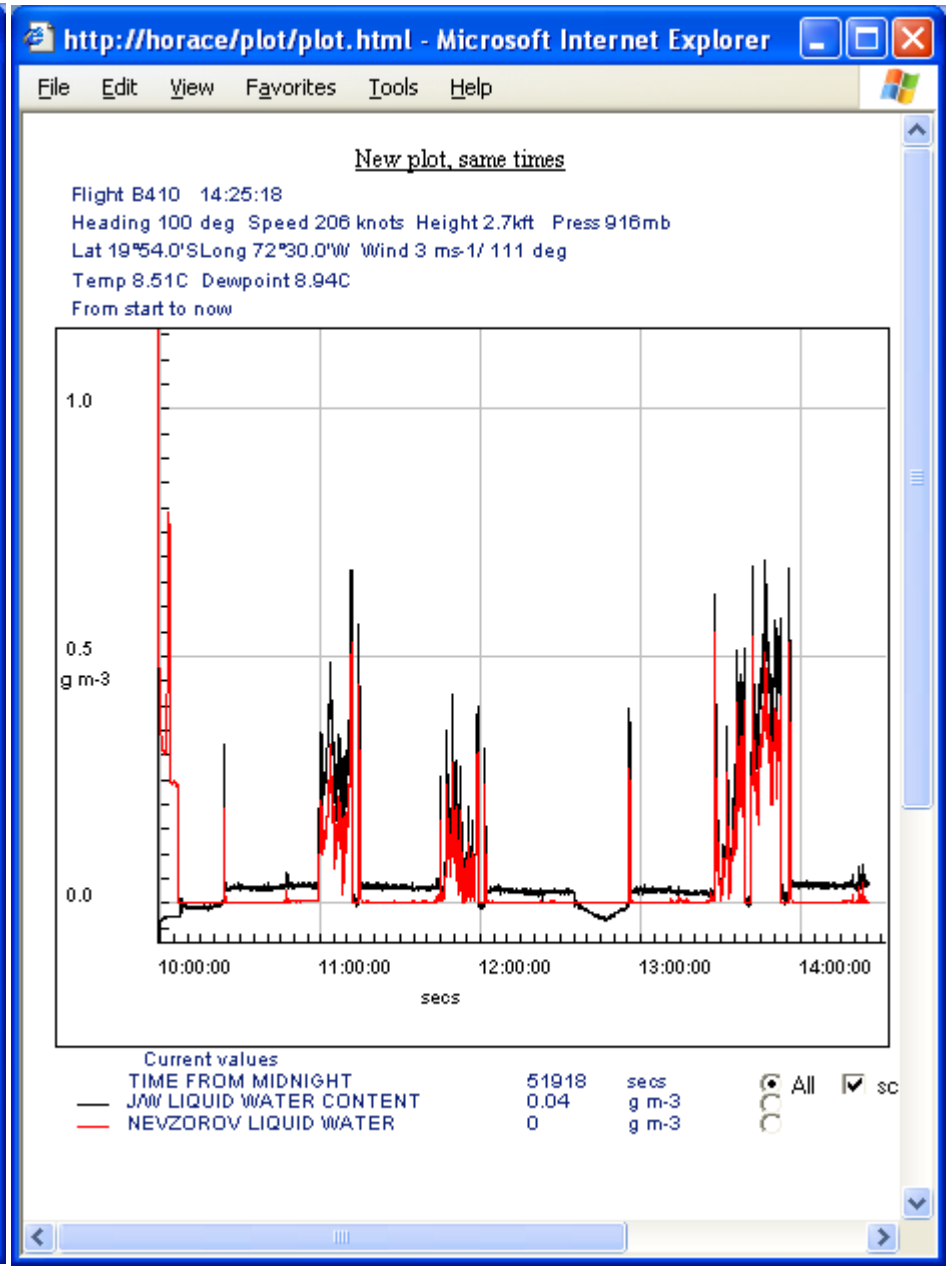




P24 end R6.1 start

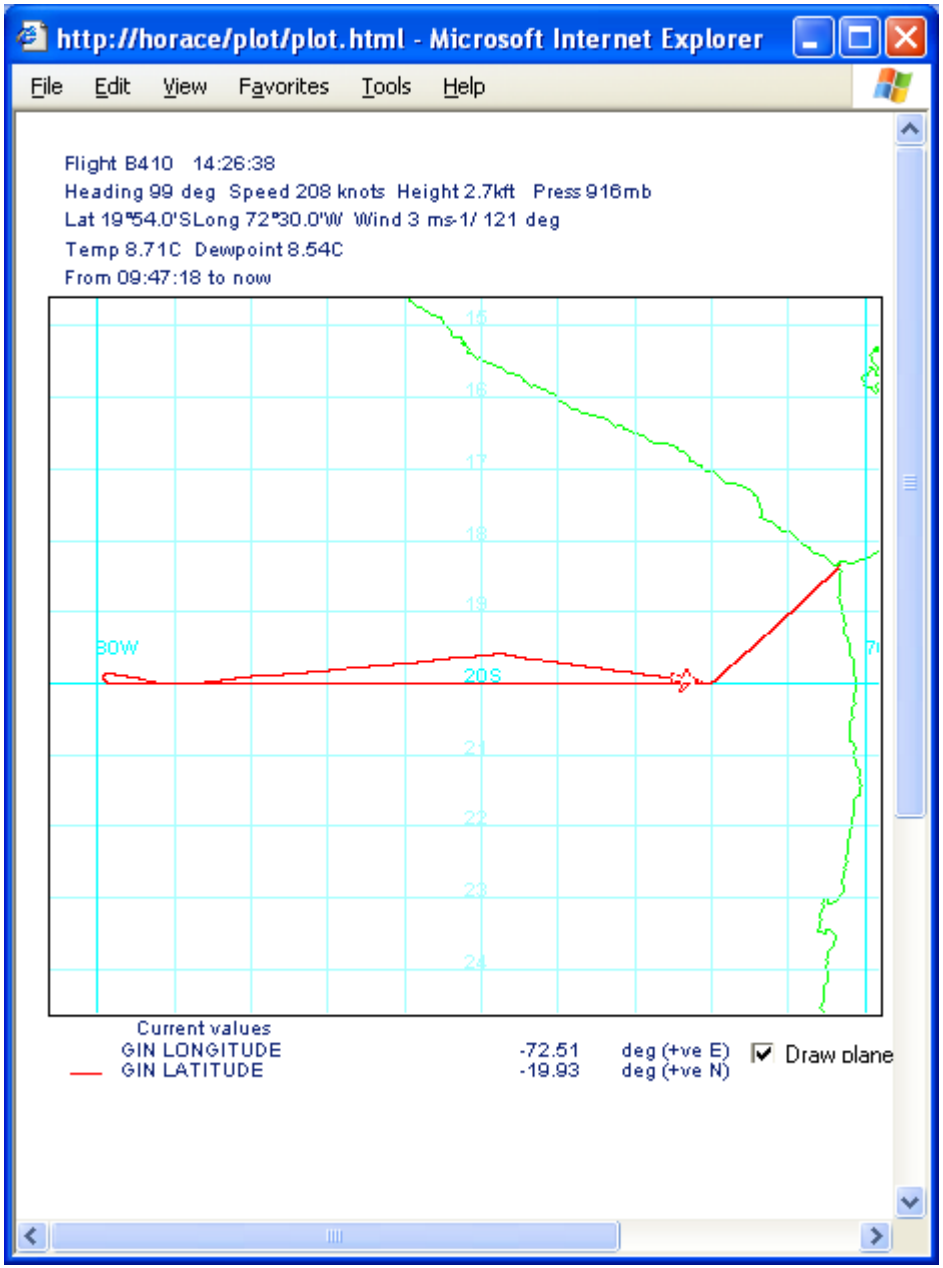
P6.1 end at 500ft P25 start to 2900ft

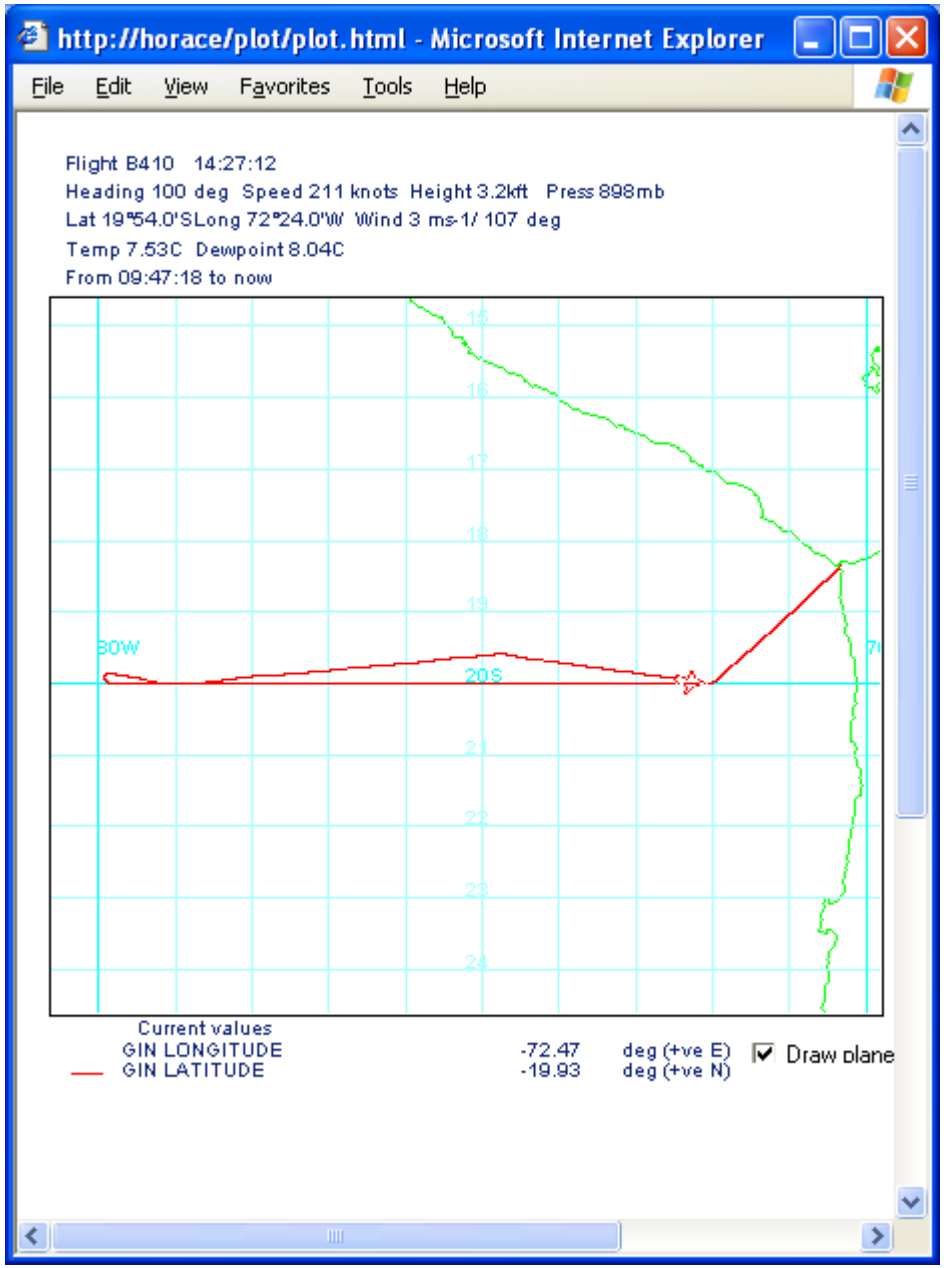




End P25, start R6.2 at 2900

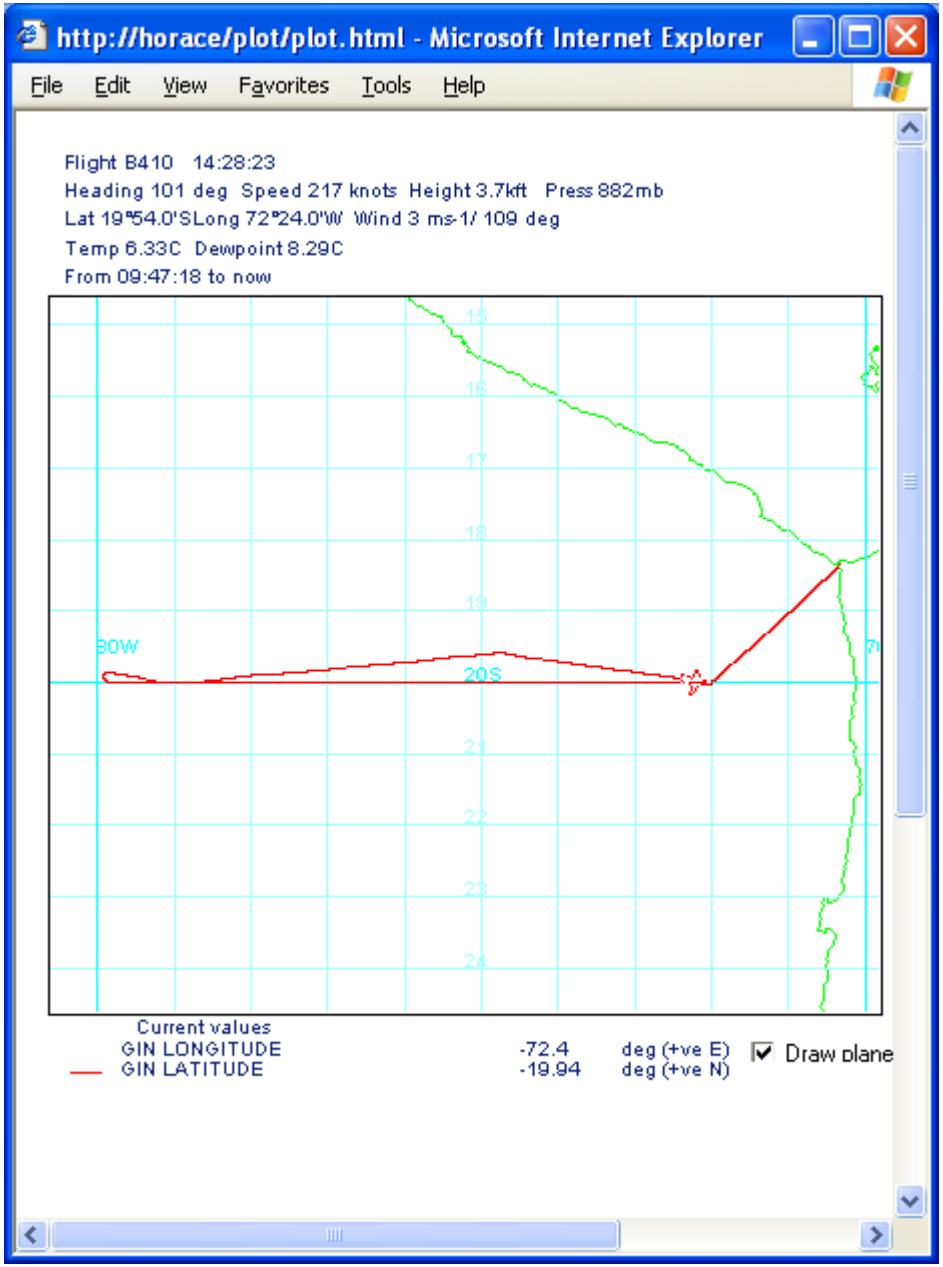
R6.2 2900ft below CB but in Cu base

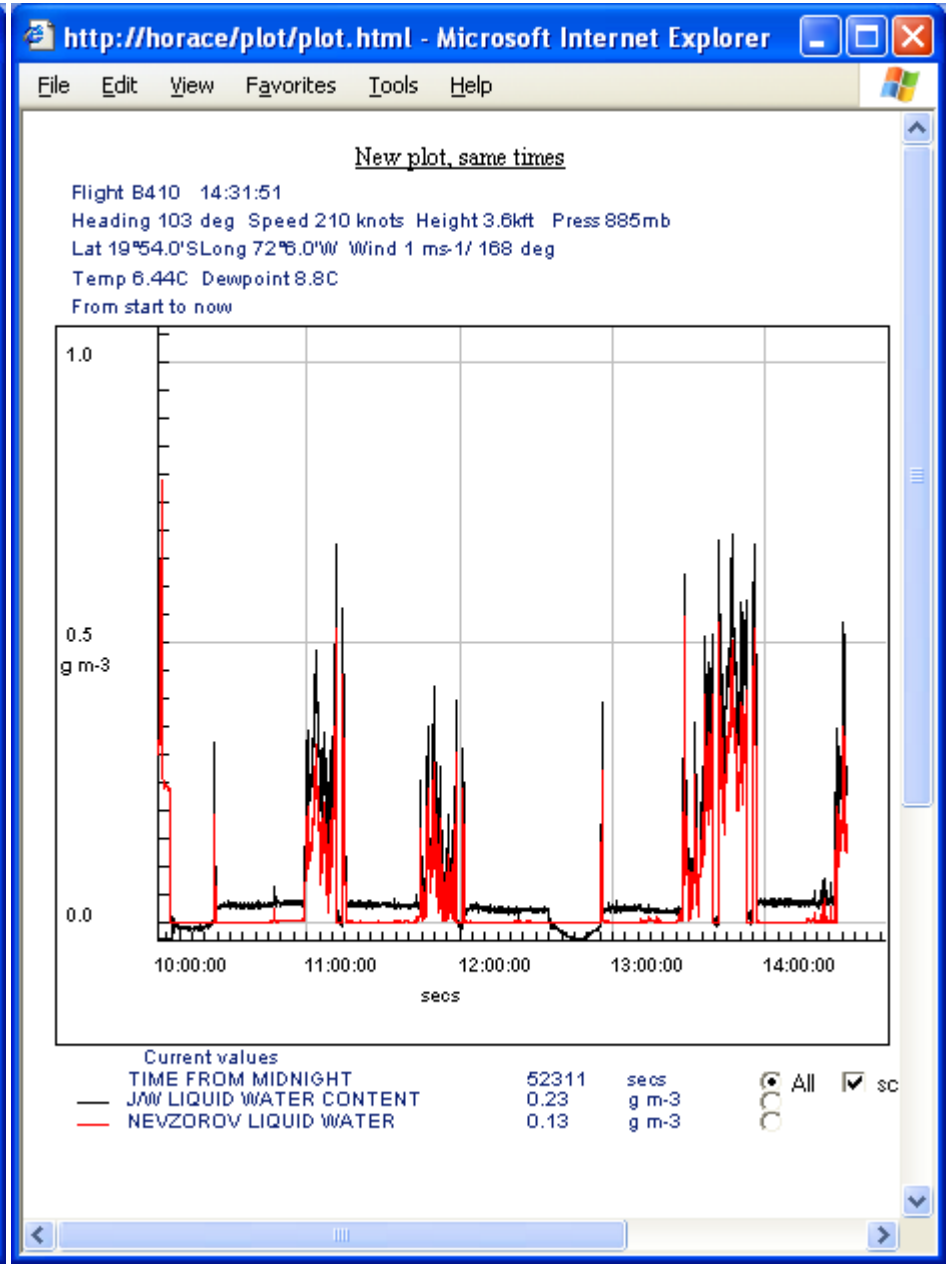




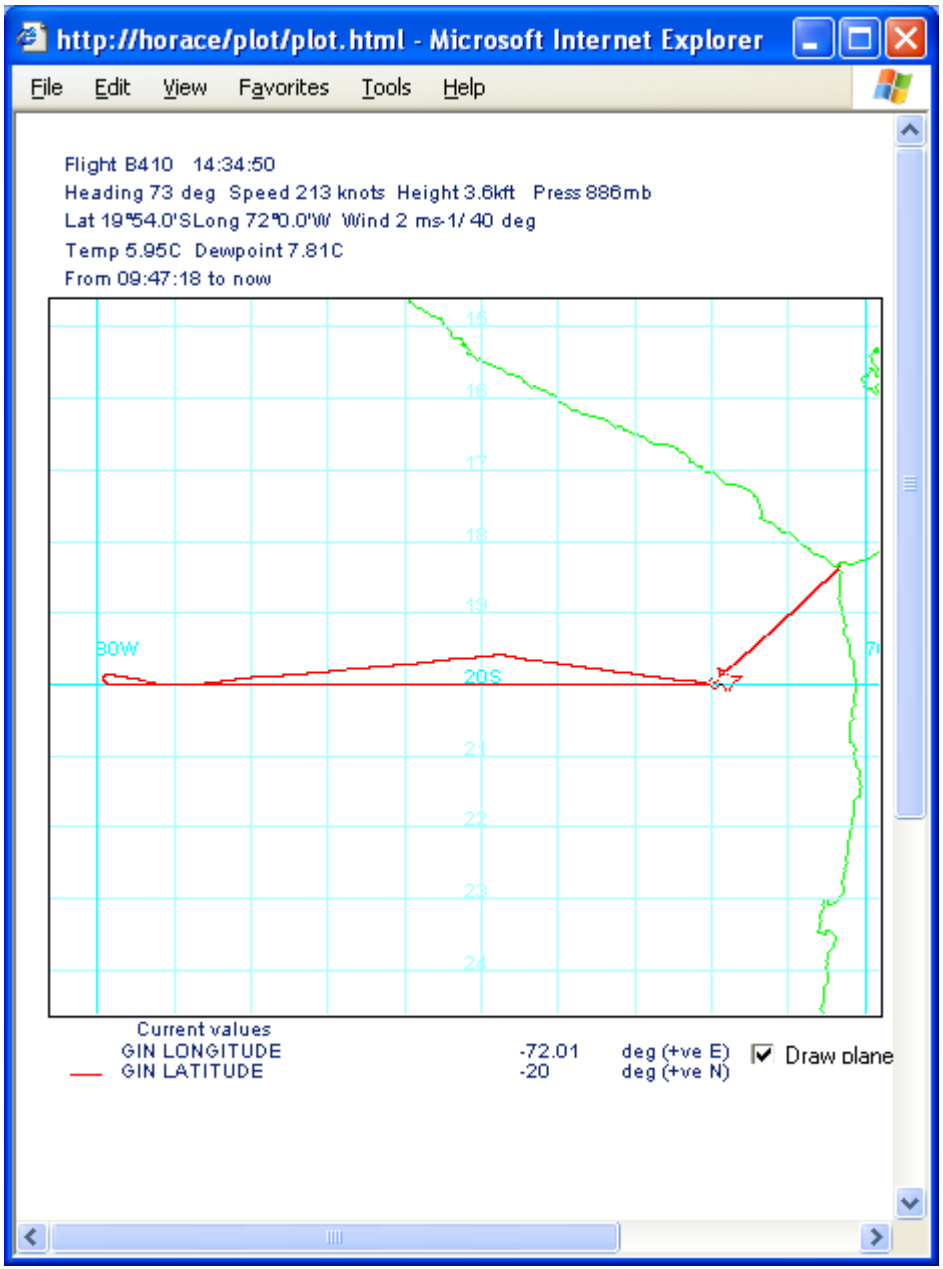
End R6.2 at 2900 start P26

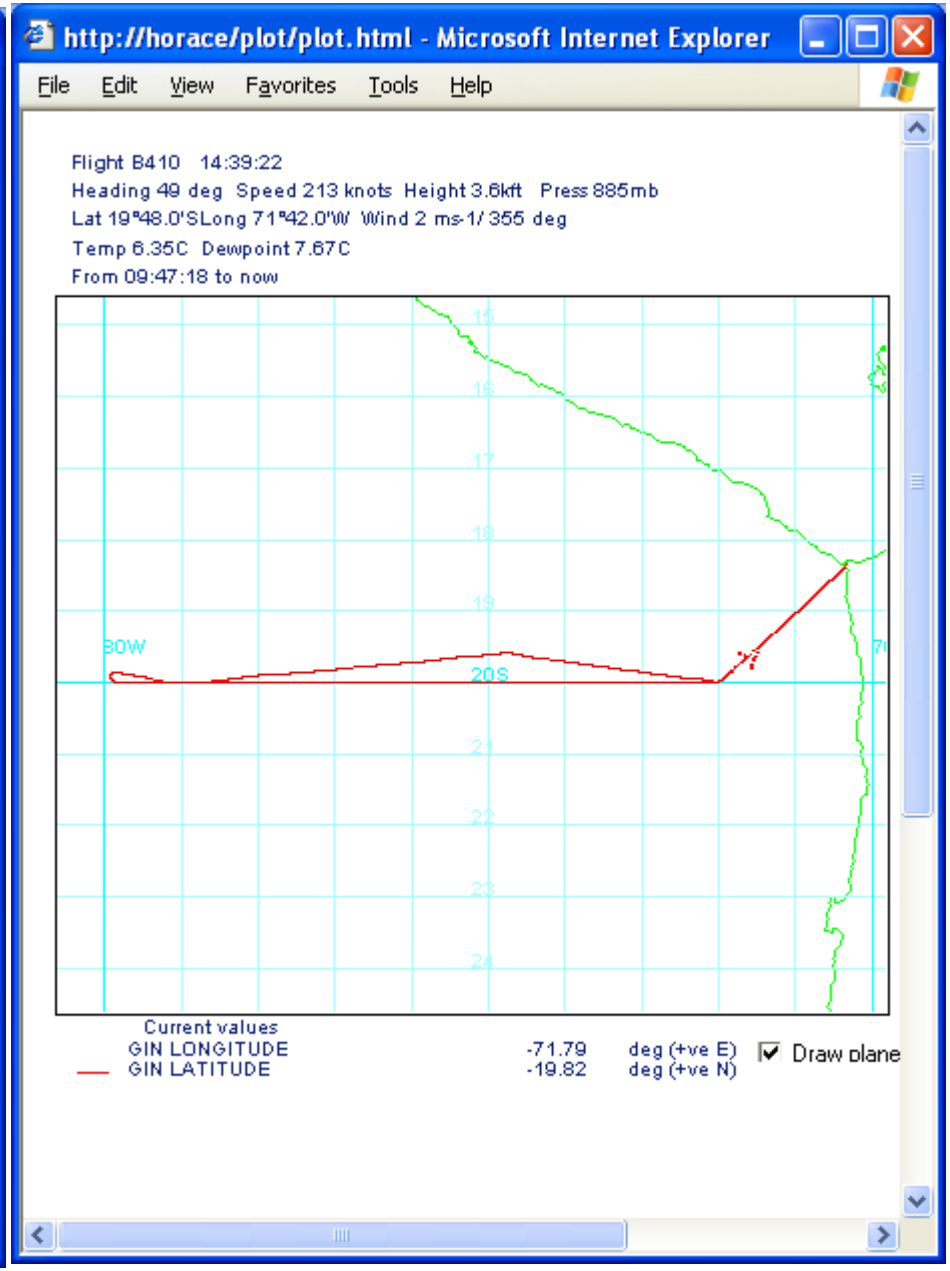
In cloud on P26





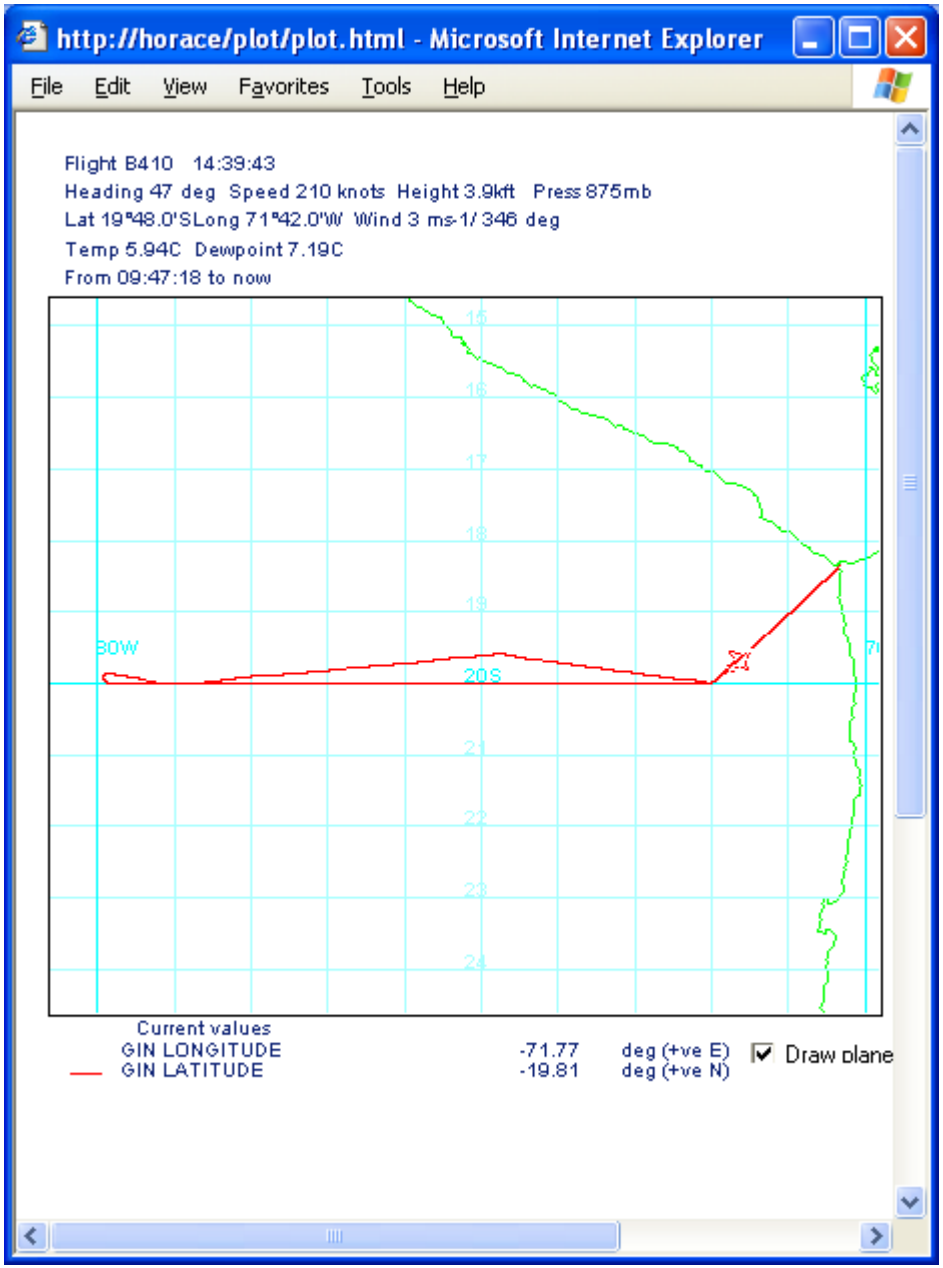
R6.3 at 3800ft (dropped down from 4300 at CT)

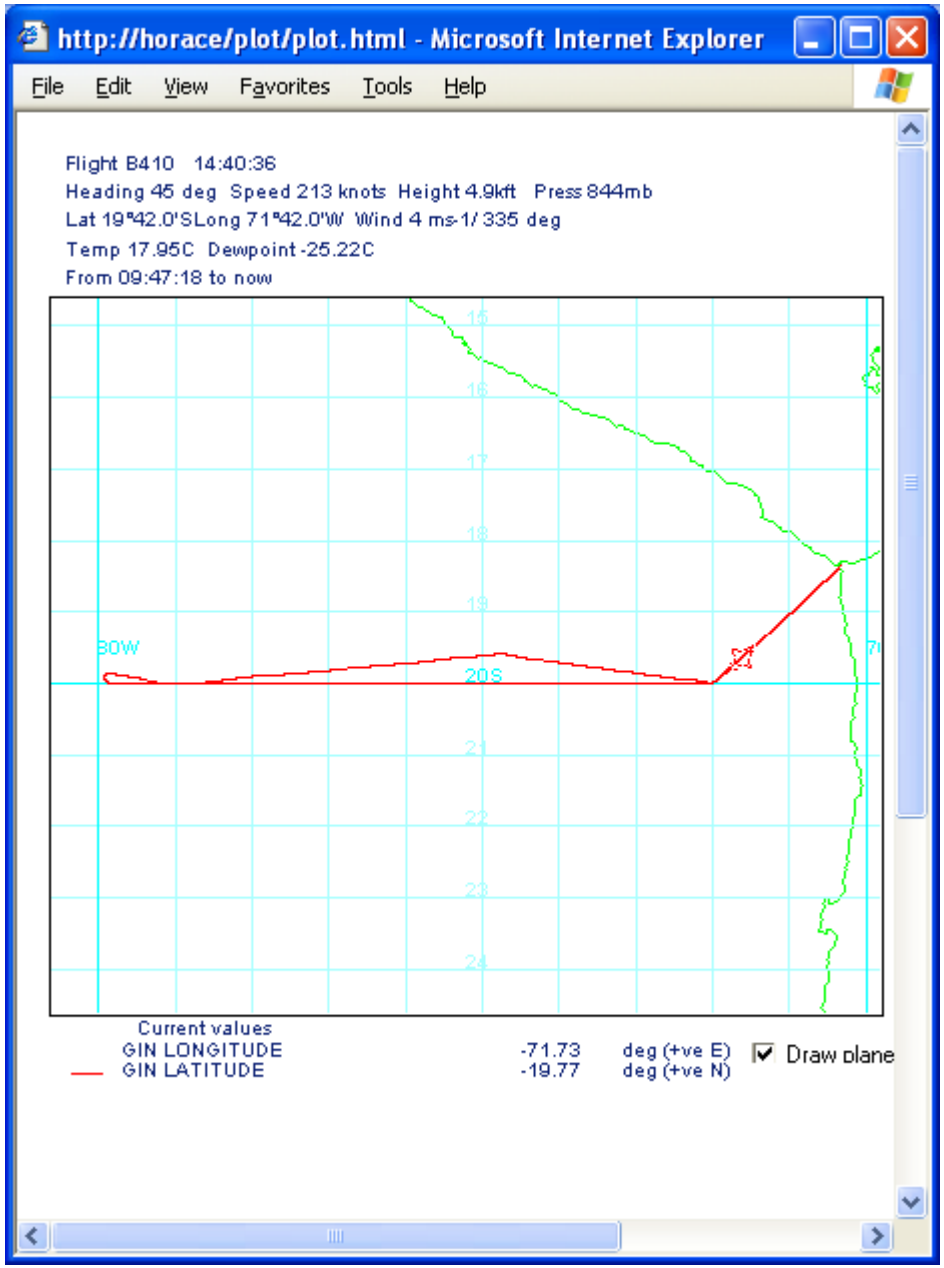




Turn at alpha R6.3

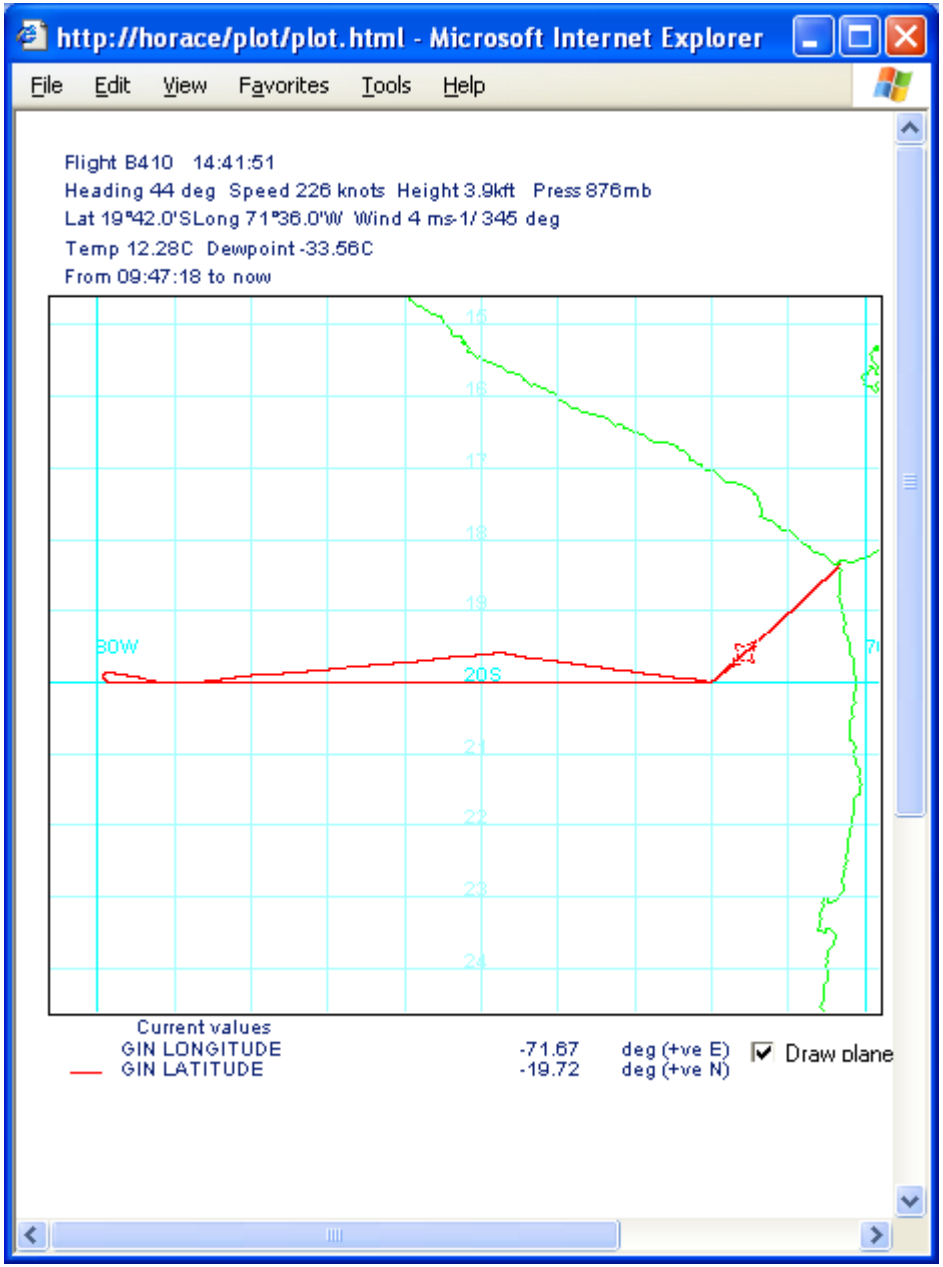
End R6.3 P27 start

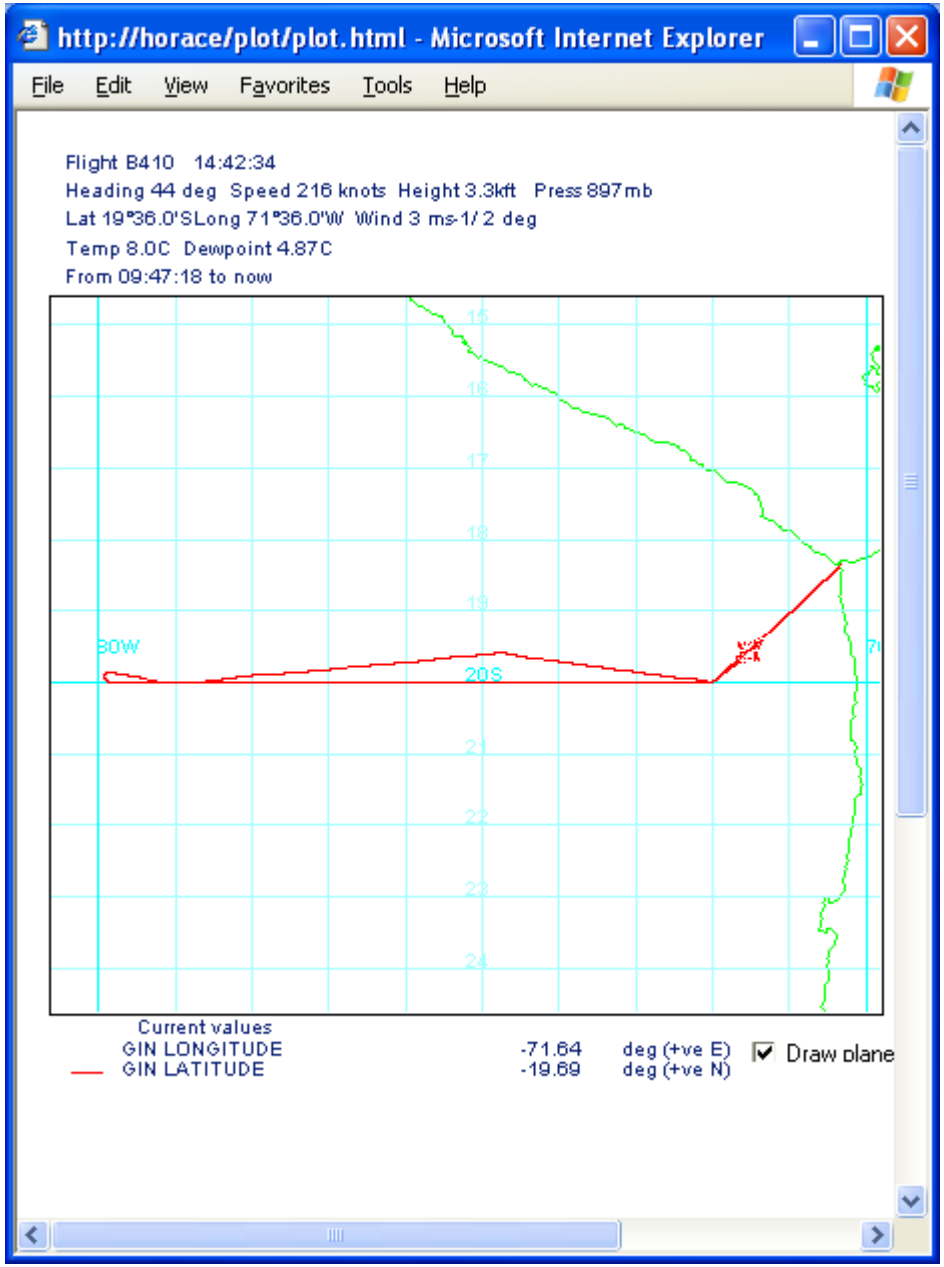




P27 CT 4200ft

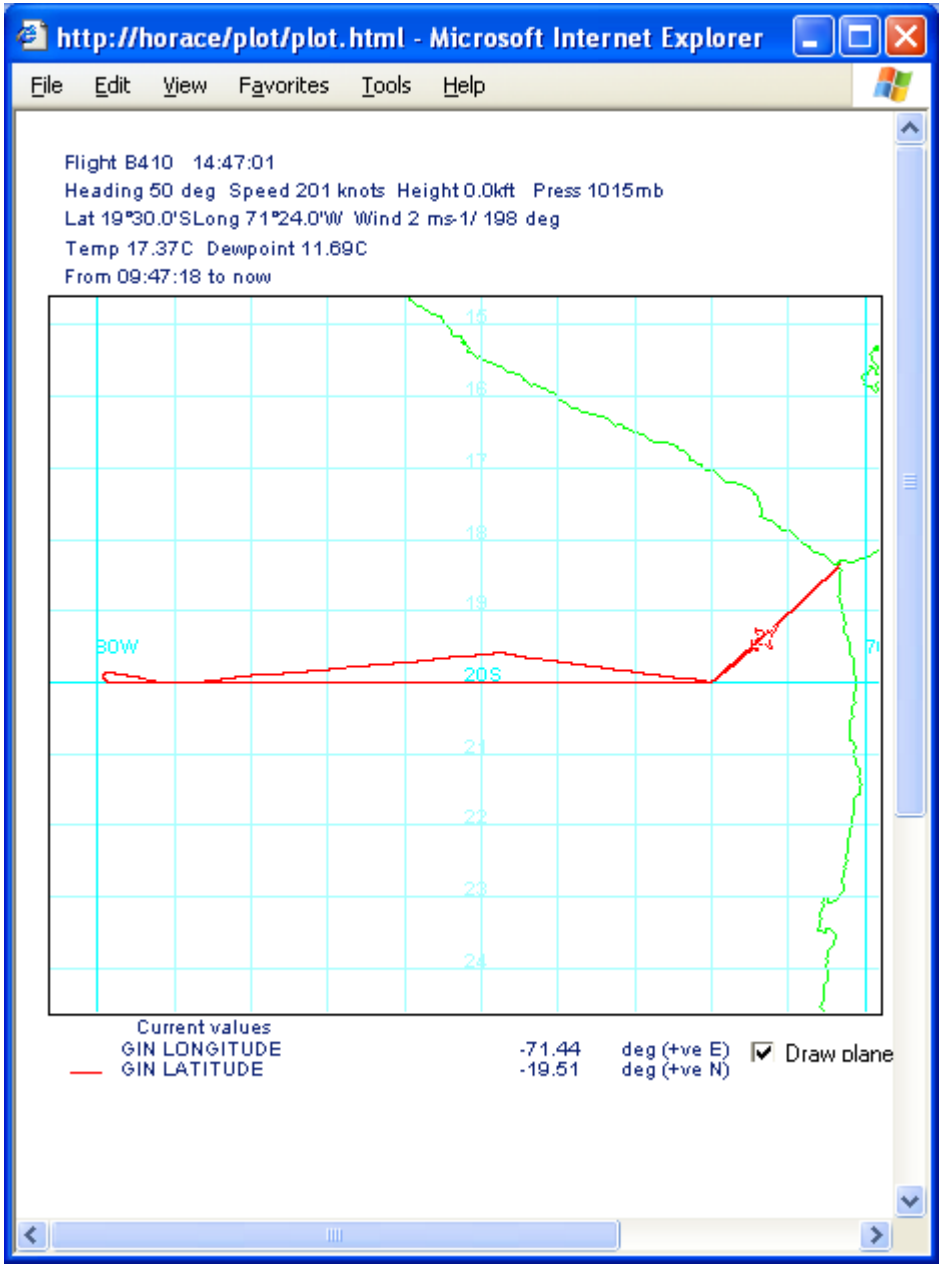
P27 end P28 start 5200ft

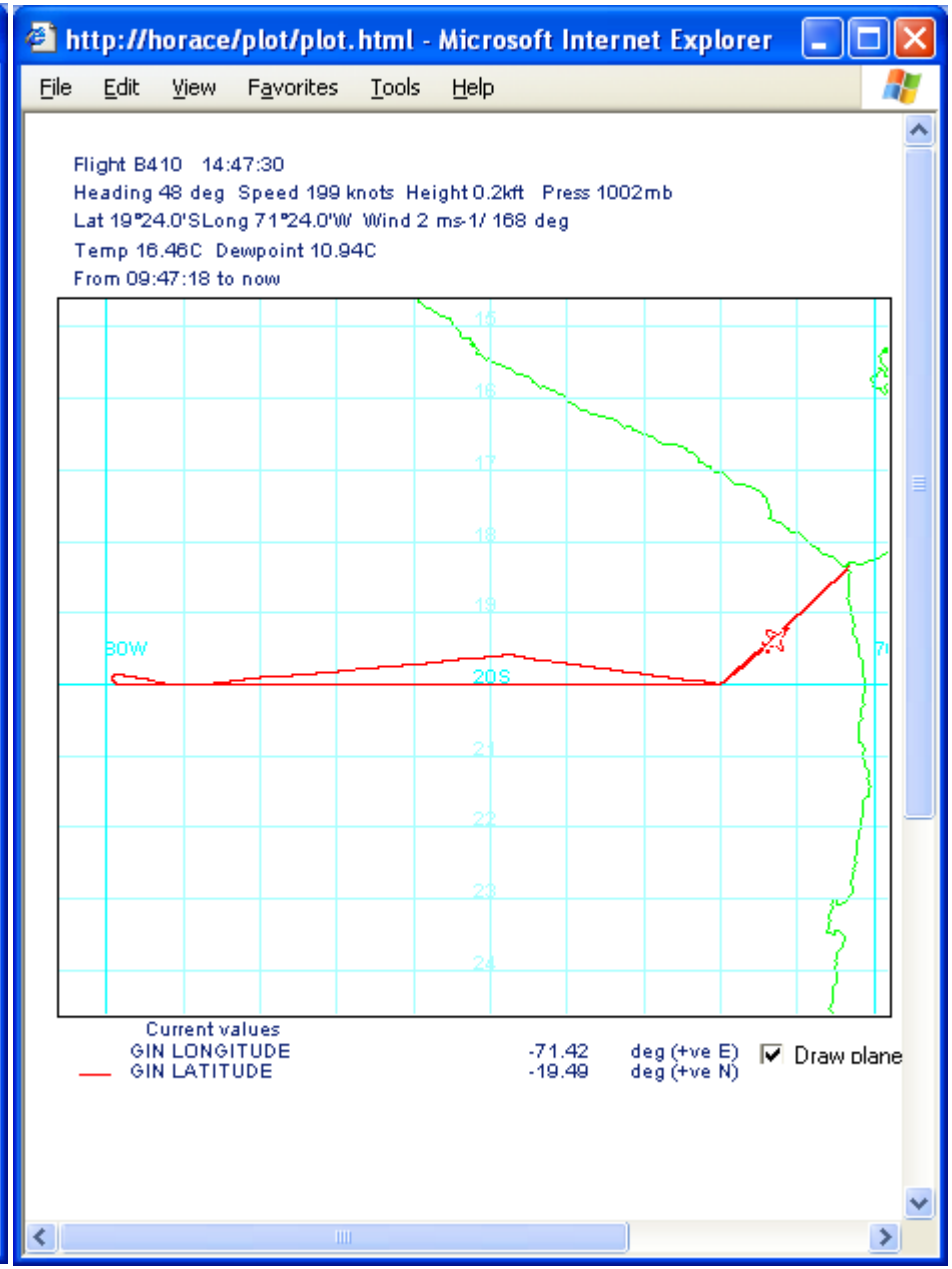




CT 4200ft P28

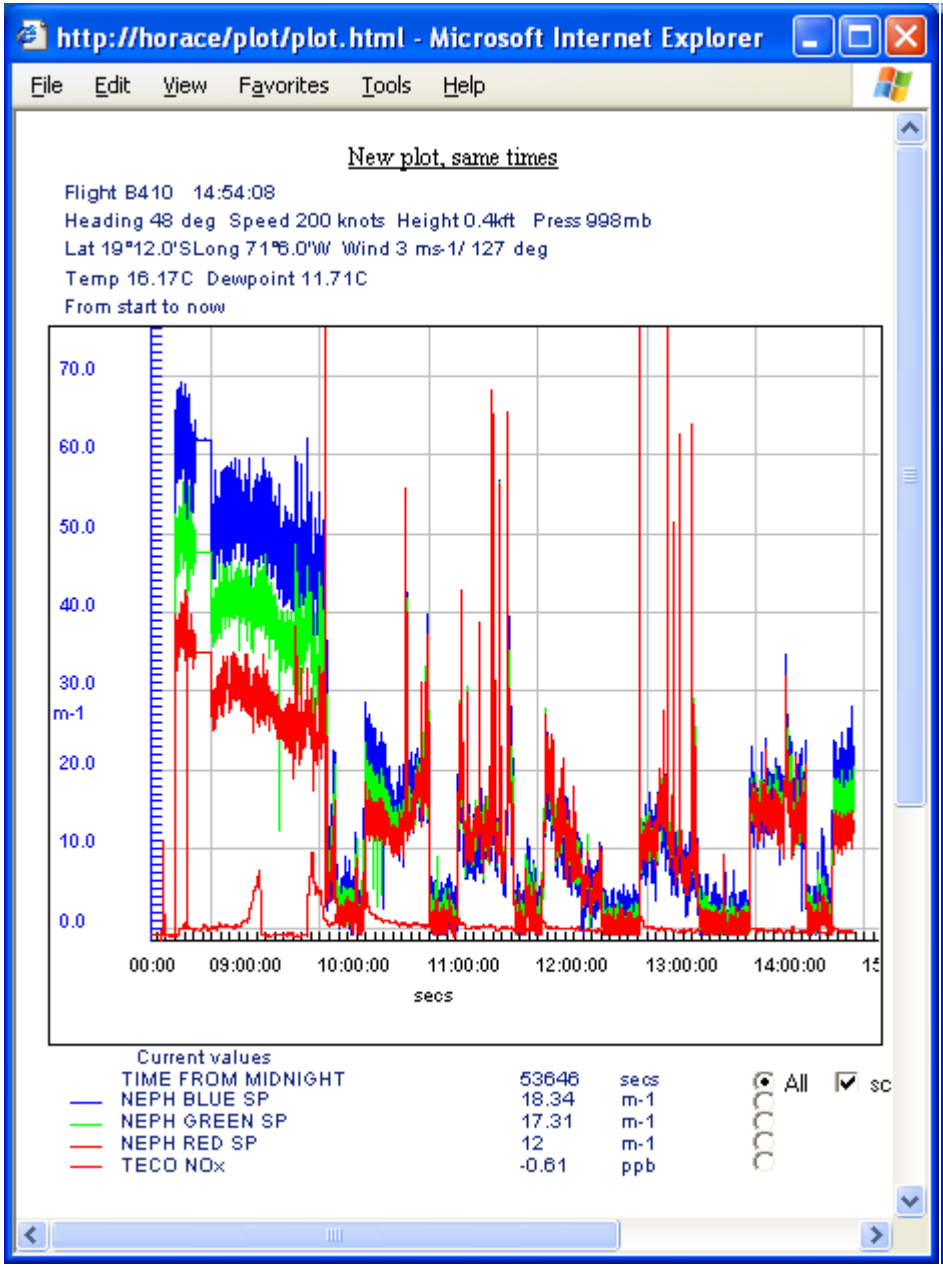
CB 3600ft P28

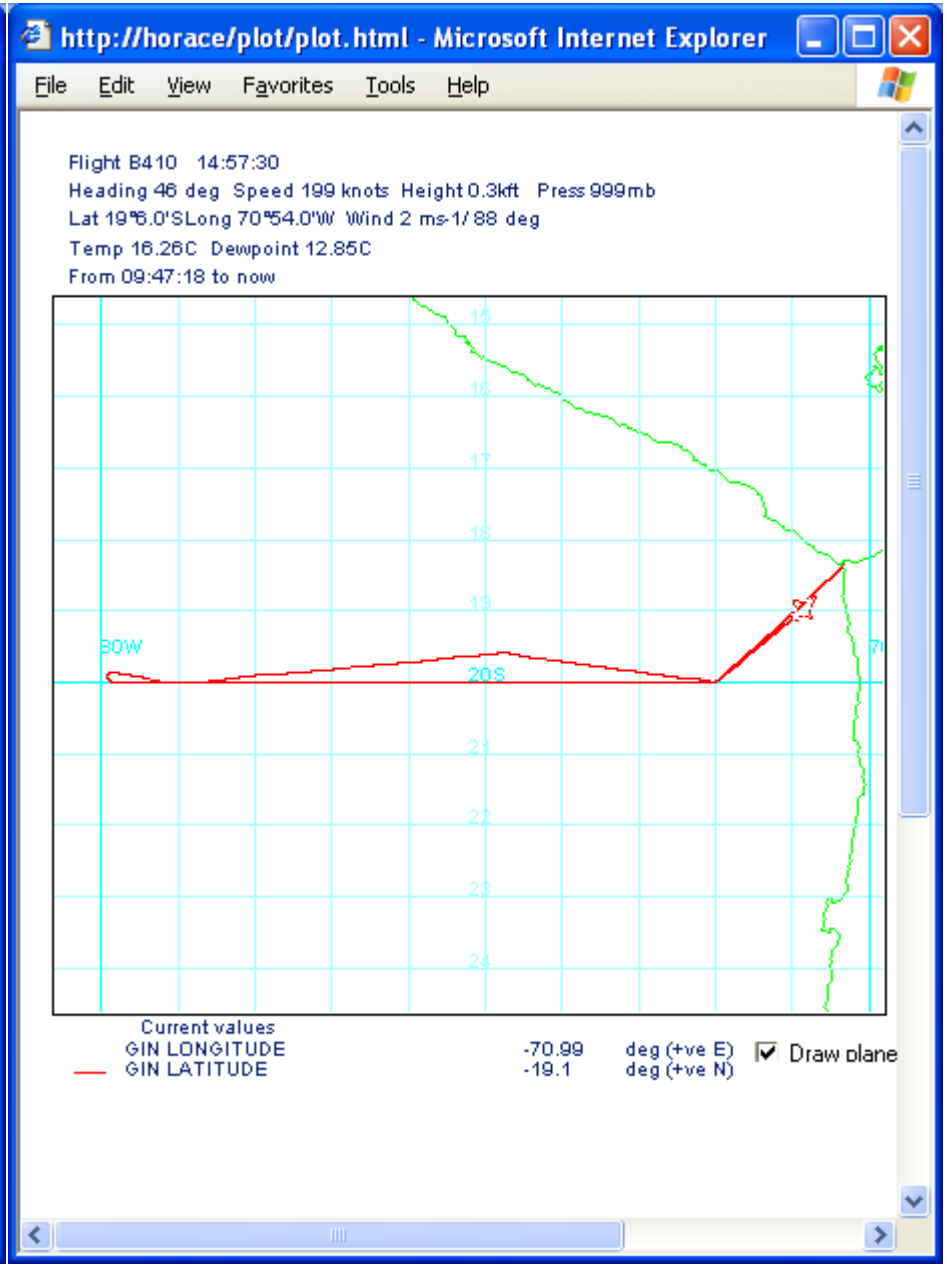




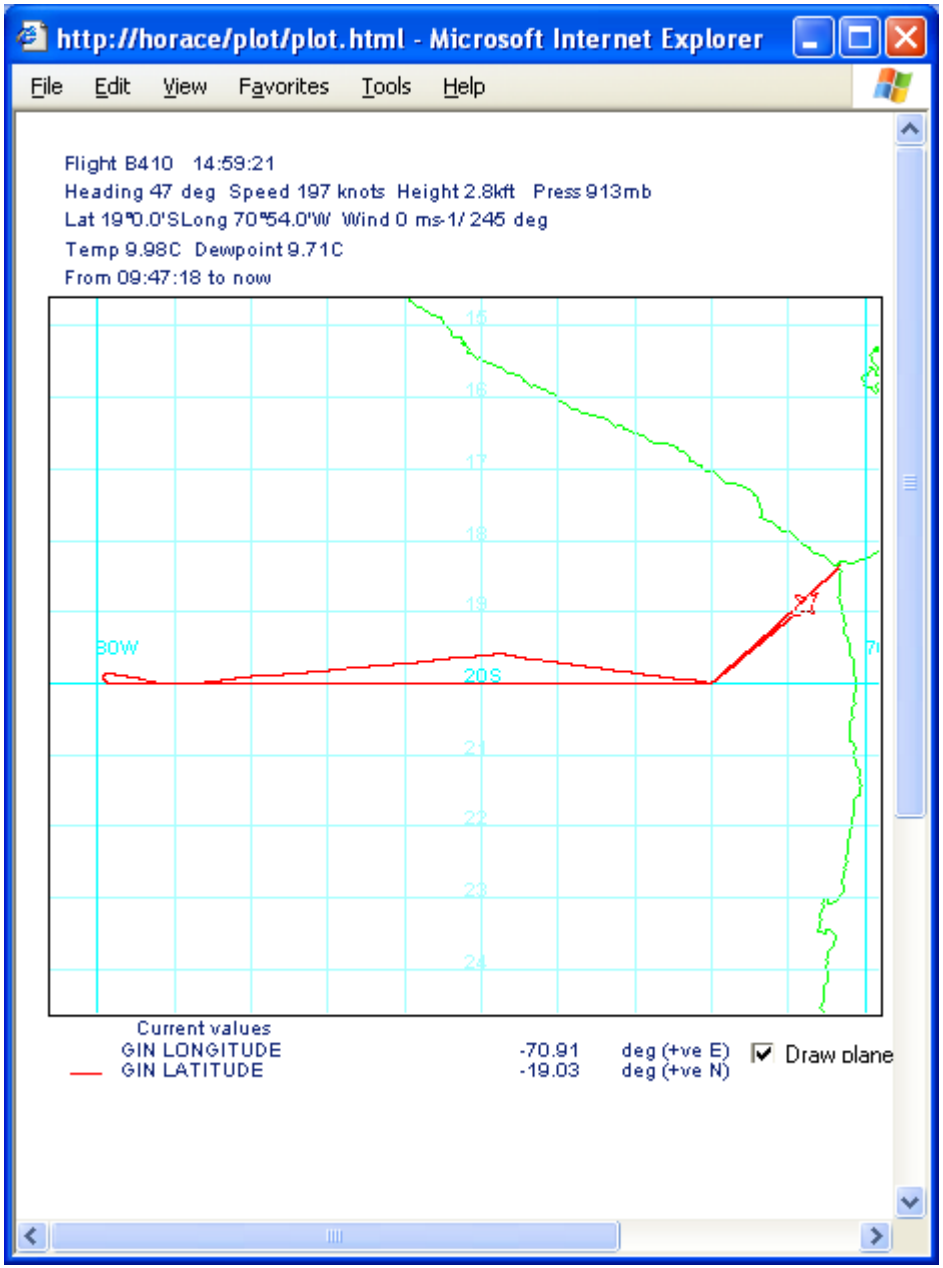
P28 end P29 start at 50ft

P29 end/R7.1 start 500ft

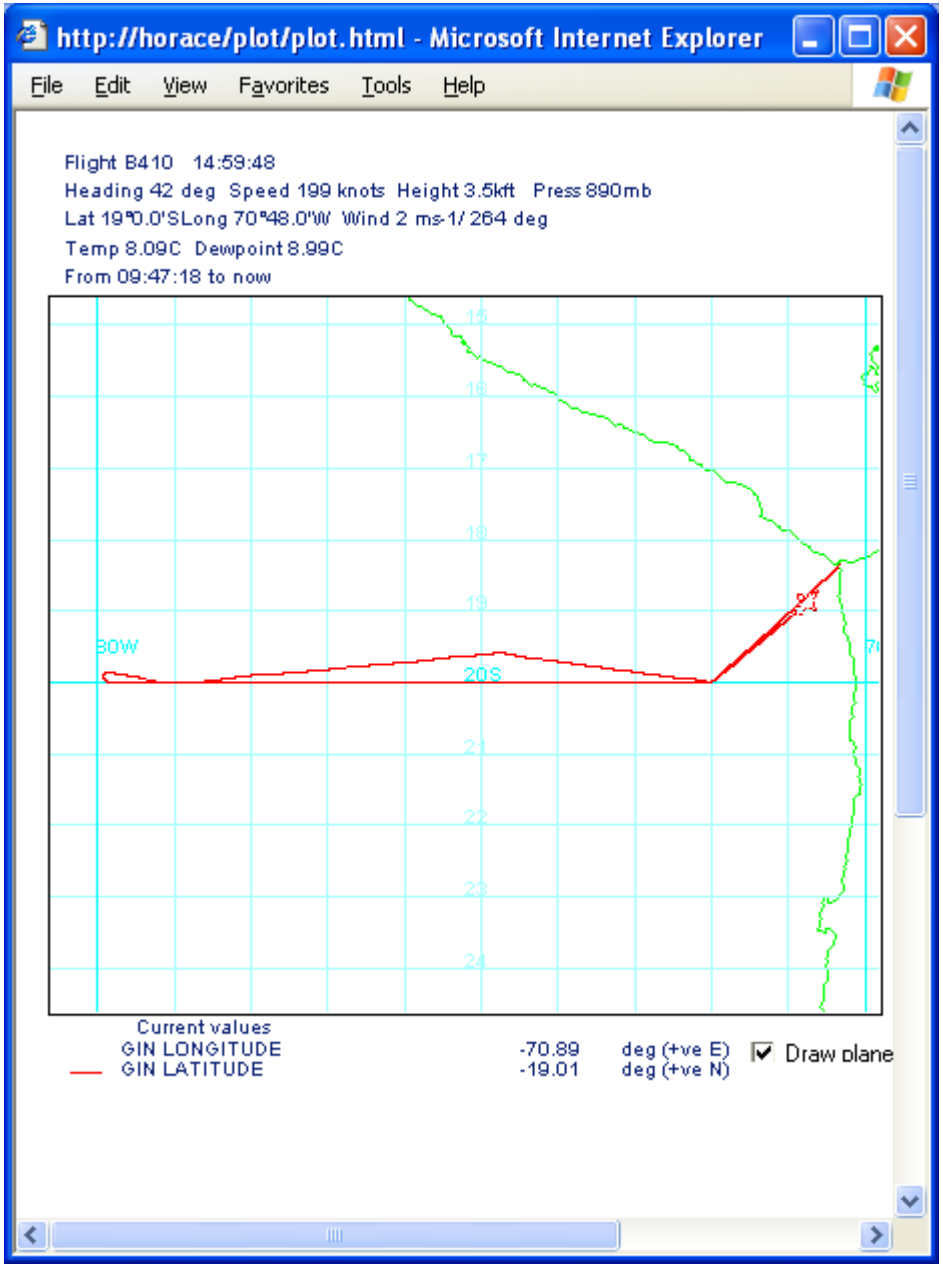


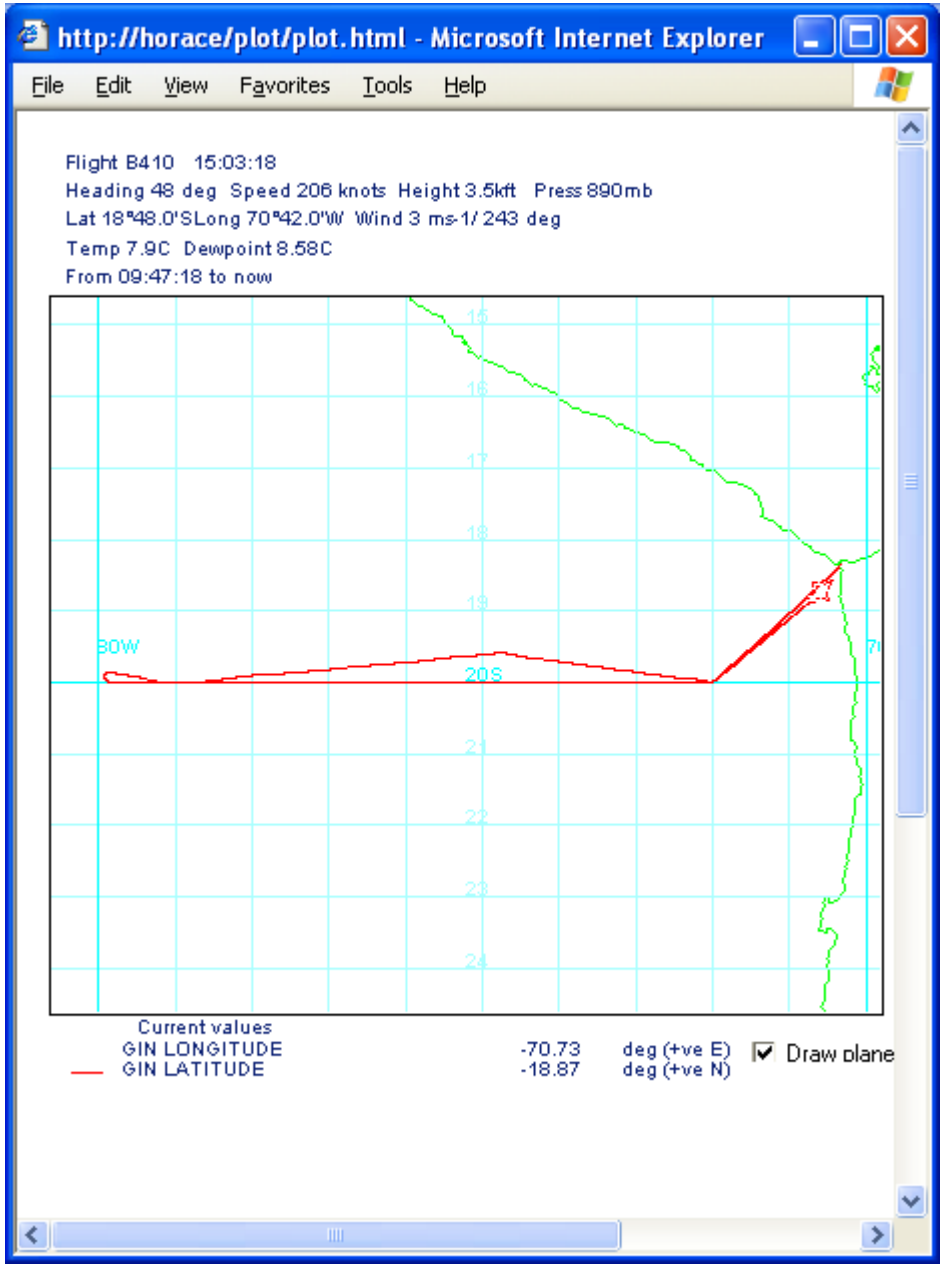


R7.1 end at 500ft P30start


http://horace/plot/plot.html - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Flight B410 14:59:21
Heading 47 deg Speed 197 knots Height 2.8kft Press 913mb
Lat 19°0.0'S Long 70°54.0'W Wind 0 ms-1/ 245 deg
Temp 9.98C Dewpoint 9.71C
From 09:47:18 to now
80W
20S
Current values
GIN LONGITUDE -70.91 deg (+ve E)
GIN LATITUDE -19.03 deg (+ve N)
Draw plane

P30 CB





R7.2 in cloud dropped 100 to 3600ft Out of CT

NIISS Sc1.2

Mission Scientist's Log

Flight No B.40 **Date** 29/10/08 **Name** PHIL BROWN **Page** 1 **of** 3

Time (GMT)	Run / Profile	Height	Hdg	GPS Position	Remarks / Observations (cloud type & amount in oktas, weather, visibility, winds, sea state etc.) eg Cirrus 2/8, StratoCu 3/8, hazy, wind 240°/24kts
1057					CCN only 5 cm^{-3}
					but VAC reports Sulphate
					but low sea salt.
1058					Drizzle, peaks only 7-10 L^{-1}
105936					3000 ft cloudbase.
110001		3500			Run 2.3
					2DC ~ 30-50 L^{-1}
1105		"			2DC - 70 L^{-1}
					CDP - 150-200, MF 120-150
					17 µm 14
110915					LWC dropped along with drizzle conc.
112230					PCASP ~40 CN ~200
112745					lower SO_4,
1129					Cloud 'ledge' ahead on video.
					Drizzle was absent in r3.1 sq
		2000			on r3.2, 2DC peak ~ 10 L^{-1}
114420					Drizzle 10-20 L^{-1} & 800 µm max.
					Just thin cloudbase at end of run.
		~~3500~~			V. variable cloudbase, signs of
					lower Cu formation.
		3900			on 3.3. 2DC 20-50 L^{-1}
115736		1 "			~ 1/8 Cu below the Sc base
		4900			cloud top.
1211		500			Coming under clear area.
1216					280 CN, 20 @ 0.6% CCN.

Mission Scientist's Log

Flight No B.440 **Date** 29/10/08 **Name** ..... **Page** 2 **of** 3

Time (GMT)	Run / Profile	Height	Hdg	GPS Position	Remarks / Observations (cloud type & amount in oktas, weather, visibility, winds, sea state etc.) eg Cirrus 2/8, StratoCu 3/8, hazy, wind 240°/24kts
122311		3000			Run 4.2 50 PCASP
122611					in turn at W point.
					Low CCN @ 0.6% CAS 4 cm^{-3}
—				71° 56'	west point. v thin Sc layer above. more extensive to the N.
123313		〃			Profile to FL100 or above.
					19 ~~53~~ 35 .18S ~~74~~ 46.80 W RHB
					@ DART buoy.
—					1342 etd RHB.
125539					into cloud on profile Y
—					Occ Cu penetrations visible.
					CCN was no good to me.
130159	↘				- Still decoupled BL stratocu in last profile down
~~1301~~		500			Run 5.1 P16
131146					Drizzle patches reaching sfc.
		1500			on r 5.2, 2DC ~ 5 l^{-1} peaks.
1327				71. W	Still Cu below the Sc base.
132807		3900		75 48 W	r 5.3 start. 2DC up to 100 l^{-1}
					but Dmax 150 μm.
1335					2DC 50-100 l^{-1} 300 μm max.
—					CDP 70 cm^{-3} MFSP 50 cm^{-3}
					18 μm 13 μm
					CCN 30 cm^{-3} @ 0.1% out of 200
133811					end 5.3
		14800			cloud top

Mission Scientist's Log

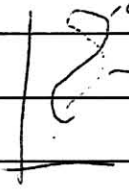
B410 29/10/08

Flight No B.~~369~~ **Date** ~~29/10/08~~ **Name** ..... **Page** 3 **of** 3

Time (GMT)	Run / Profile	Height	Hdg	GPS Position	Remarks / Observations (cloud type & amount in oktas, weather, visibility, winds, sea state etc.) eg Cirrus 2/8, StratoCu 3/8, hazy, wind 240°/24kts
13466					CDP, MFSSP comes similar.
134811					o/h RHB point.
					2DC 50-100 L-1 150μm.
		4700			cloud top after run.
1401					50/300 CCN counts.
140247		500		73 52.0W	R6.1 Bk looked a
					little more well mixed on that
					profile (24).
141610		2900			R.6.2 below cloud.
					Drizzle 2DC ~ 5-10 L-1
					150-200μm.
1422					Thin patches of Cu below
					Sc base.
142806		4300			tops
142823		3800			R6.3 2DC ~ 50 L-1
					MFSP 150 CDP 200
					13 17

Mission Scientist's Log

Flight No **B** B410 Date 29/10/08 Name P. BARRETT Page 1 of 7

GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
09.52					TAKE
10.00					T/O
10.02					cloud base ~2.3 kft
					cloud top = 3.5 kft
07:34:43	P1				
	P2				-- Neph profile - layers at different
					altitudes on descent profile
					
					cloud top = 4.3 kft
					cloud base = 3.3 kft
	(P3 - up to 50ft)				HWL spike @ 0.2 gm^{-3}
R1					4 minutes to reach Point X
					PCASP ~ 200 cm^{-3}
				AMS	sulphate - acc mode ~300nm
R2.1	10:33:52				POINT X
					CPC (CNC total) ~ 550 cm^{-3}
					PCASP ~ 25 cm^{-3} base cloud
					can in aerosol mode.
					CAS = 7 cm^{-3} > 6μm
					nothing above 3μm
					wind similar to previous days.

Mission Scientist's Log

Flight No **B**410 Date 29/10/08 Name P. BARRETT Page 2 of 7

GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
10.43					CPC concs have fallen off as we move away from the coast
					~500 → 300 cm^{-3}
10.45					sub cloud for CVI zero.
1046	R22				CVI zero
					cloud at 3000
					and at 2500
					2.4kft - lots of turbulent
					activity
					- cloud droplets??
					300ft below cloud
					some drizzle below cloud 2D
					- not much
					- can't detect on FSSP
					- may be giving the CVI
					problems with a zero.
					- Cloud base 3.0kft
10.59:01	R23		3.4		AMS - high masses - is it real?
					or is it oil, glue, sealant
					Drizzle - light on windows
					CDP - 150 - 200 $\rho = 17\,\mu m$
					FSSP(M) 125 - 150 $\rho = 14, 15\,\mu m$
					CAS - 13 - 15 μm 300 - 350 cm^{-3}
					LWC = 0.5 $g\,m^{-3}$

$LWC_{CVI} \approx 0.34\ g\,m^{-3}$

Mission Scientist's Log

Flight No **B**..... Date ..... Name ..... Page 3 of 7

GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
					cloud top ~4.6
					cloud base ~3.1
					Drizzle below cloud
11.19.01	P7	500ft			BIG drizzle drop 7800μm?
					-core cloud
					2DS ~>
	R3.1				500ft above sea level
11.28					Dip, drizzle decreasing at the
					increases. Drizzle in blobs/places.
11320	P9				climbs to sub cloud run.
					visible cloud base.
113417	3.2				sub cloud run 410 cm^3
					Drizzle. pockets - carried on
					SW, NE,
	11.42				cloud base dropping
					some structure to cloud
					aerosol on Neph.
	11.44				Big drizzle drops
	11.44				in cloud.
	P10				climb "to" cloud
114707	3.3	3744			in CVI mode
					near cloud top
	11.52				near cloud base

Mission Scientist's Log

Flight No **B**...470... Date ..29/10/08... Name P.BARRETT Page 4 of 7

GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
1133	1				- Into in cloud, strong turbulence
					- Down draught ??
(11.52)					AMS - high mass organics, sulphate.
					CDP 50 - 150 cm^{-3}
	P11				Big increase in LWC with height
	up-> point and back Down				Cloud top ca. 9kft
					Lots of Cu, 3/8 above
					cloud top ca. 7kft.
					Cloud base 3.8kft.
					↳ variable.
					De capped - temp structure
					→ Combs below 5c
12:07:42	R4.1	5aft			aerosol dry
					inhomogeneous cloud above.
12:11					Break in cloud
					RASP 55 cm^3
					280 CN counts total
					CCN (max) = 20 at 0.6% supersat
12.16:00					- increase in turb
12:18	P'				end R4.1
					climbing to a run at the same level as last cloud run
					- run will be in cloud free region

Mission Scientist's Log

Flight No **B** 410 Date 29/10/08 Name P. BARRETT Page 5 of 7

GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
12:23:11	R42	3.0kft			Popped above inversion, it is lower than previous.
					only 10% activated for this CCN at 0.6% supersat in the cloud free region – only "UN-activatable" particles are left??
					Similar to C130 results in POC
					Decoupled – change in stability at ~950 hPa
					dry above
12:33:13	Profile to 10kft. and back				
					= Sc thinning.
					Cu layer
			35:48		
					Ron Brown is at 19° 38.483 S 74° 46.804 W
					CCN inlet has been CLOSED for the outbound leg.

S6

Mission Scientist's Log

Flight No B.~~410~~.... Date 21/6/08.. Name P. BARRETT Page 6 of 7

GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
125357					Cloud Top = 4.6kft
					cloud base = 3.9kft
130255	S.1	500ft	W		Cu below Sc.
					Drizzle - 2D
13:13:34	S2	1.3kft	WNW		TOTAL WATER (NEVE) seems to pick up drizzle better than other LWC probes.
1317					large drizzle 2D, Nevz
1323	P19				drizzle
13.28.	RS3	3.6kft			in cloud top, lumpy 3.6kft
					patchy cloud Peak 0.6 gm^{-3}
					small drizzle - 2D ~80 cm^{-3}
1332					LWC ↑ larger Drizzle
					fsp(cn) 50 cm^{-3} 13μm
					CDP 70 cm^{-3} 18μm
					2DC 100 cm^{-3}
					updrafts and high LWC
					~3 ocean. 13.28
					13.33 13:36
					CFS ~250 cm^{-3} d~20μm
13:38:10	P20				to cloud TOP,
					CLOUD TOP 4.7kft.
13:42:12	S4	4.3kft			- inbd over RON BROWN
					Higher LWC than at 3.6kft.

Mission Scientist's Log

Flight No **B**.410.... Date 29/10/08 Name P. BARRETT Page 7 of 7

GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
1352				4.4 —	cloud top = ~~8~~ 3.7kft
1354 18	P23	5.5->5.0			cloud base ~ 2.8kft
					CN min = 60/300
					C-F 30/400 d-finest West.
14:02:07	r6.1	500ft			looks like full cloud cover above.
14.16.10	6.2	2.9kft			Drizzle. ~10 cm^{-3} small
					↳ N$_t$ - very clear signal
					Tw - in the noise.
14.18					FSSP - in cloud / patchy
14.19					sudden unadjusted zero (?) ?!
14.19				—	TW above the noise.
					some small Cu
14.24				—	hit cloud
14.28.28	r6.3	3.8			cloud top ~ 4.0kft.
					lower LWC than previous more
					westerly cloud top values.
					FSSP = 150 13 μm
					CPP = 200 17 μm
	Droplets increased				2-DC 60 t^1
	towards cloud top - CDP				CAS = 380-400 13 μm LWC ~ 0.3
					CVI LWC ~ 0.18
14.30					spike in LWC
14.34.34					turn back to ARIA at Point X
					mid run.

r7.2 — cloud top popping cloud thinning at top

prev | next

VOCALS BAe-146 Instrument status Report

Date of report(UTC): 2008/10/29 17:00
Author of report: Keith Bower
Submitted at(UTC): 2008/10/30 21:08

Remaining flight hours: 50

General Comments:

After mission on 29/10/2008

INSTRUMENTS / SYSTEMS STATUS

= up; = provisional; = down ; = no report

Meteorology / Navigation

1.	**GPS (Patch)**	**Comment:**
2.	**GPS (Cruciform)**	**Comment:**
3.	**Temperature/Pressure**	**Comment:**
4.	**Water Vapor (Hygrometer)**	**Comment:**
5.	**Turbulence Probe**	**Comment:**
6.	**Altitude (RadarAlt)**	**Comment:**
7.	**Doppler Radar**	**Comment:**
8.	**Dropsonde (AVAPS)**	**Comment:**

Radiation

9.	**Broadband Radiometer (BBR)**	**Comment:**

10.	**Spectral Radiometer (ARIES)**	**Comment:**	
11.	**In-flight Microwave Obs System (DEIMOS)**	**Comment:**	
12.	**Microwave Radiometer Scanning System (MARSS)**	**Comment:**	
13.	**Shortwave Spectrometer (SWS)**	**Comment:**	
14.	**Spectral Irradiance (SHIM)**	**Comment:**	lower SHIMS not working
15.	**Heimann Downward-facing Radiometer**	**Comment:**	

Chemistry

16.	**Ozone (CAMP 2B)**	**Comment:**	
17.	**NOx**	**Comment:**	
18.	**CO (AL5002)**	**Comment:**	
19.	**SO2 (TECO 43C)**	**Comment:**	
20.	**Sample Bottles (WAS)**	**Comment:**	
21.	**CH4/CO2 (NIR-TDLAS)**	**Comment:**	
22.	**PAN (GC)**	**Comment:**	not operated
23.	**Volatile Aerosol Composition (VACC)**	**Comment:**	
24.	**CH4/N2O (1C-TDLAS)**	**Comment:**	

Cloud Physics and Aerosol

25.	**Liquid and Total water probe**	**Comment:**	
26.	**LWC (Johnson Williams)**	**Comment:**	
27.	**TWC**	**Comment:**	
28.	**FFSSP**	**Comment:**	
29.	**2D-C**	**Comment:**	
30.	**PCASP**	**Comment:**	possible slight noise in ch 1
31.	**Small Ice Detector (SID-2)**	**Comment:**	not fitted
32.	**Cloud and Precipitation Imager (CIP-15)**	**Comment:**	needs alignment
33.	**Cloud Droplet Probe (CDP)**	**Comment:**	
34.	**Condensation Nucleus Counter (CNC)**	**Comment:**	
35.	**Cloud Condensation Nuclei Spectrometer (CCNc)**	**Comment:**	leak from cabin during outbound part
36.	**Fluorescence water vapour sensor (FWVS)**	**Comment:**	
37.	**Dry Nephelometer**	**Comment:**	
38.	**Wet Nephelometer**	**Comment:**	brief period of lost data
39.	**Black Carbon (PSAP)**	**Comment:**	
40.	**Filters**	**Comment:**	probable contamination from inlet
41.	**Aerosol Mass Spectrometer (AMS)**	**Comment:**	
42.	**Counter-flow virtual Impactor (CVI)**	**Comment:**	zero cals below cloud may be affected by drizzle

43.	**2-D Imaging Probe (SPEC-2D-S-128H)**	**Comment:**	
44.	**CAPS**	**Comment:**	
45.	**Single Particle Soot Photometer (SP-2)**	**Comment:**	was not optimised
46.	**Fine-mode Aerosol Spectrometer (UHSAS)**	**Comment:**	not fitted
47.	**Scanning Mobility Particle Sizer (SMPS)**	**Comment:**	
48.	**Ultrafine particle counter 1 (LP-WUCPC-1)**	**Comment:**	
49.	**Ultrafine particle counter 2 (LP-WUCPC-2)**	**Comment:**	

Other

50.	**SATCOM C**	**Comment:**	
51.	**SATCOM H**	**Comment:**	
52.	**Up, Down, Front, Rear Digital Imagery**	**Comment:**	

prev | next

Back to VOCALS Field Catalog | edit | delete

comments : gstoss at ucar.edu

Chemistry Log

Date: 29 Oct 2008 Flight: B410 Operator: Doug Anderson

Preflight

No.	? or x	Location	Action	Comments
		Gases		
1	X	CO_2 / Ar	Outlet pressure is between 2 and 2.5 bar	
2	X	CO_2 / Ar	Inlet pressure not less than 20 psi	180 /185
3	X	Nitrogen	Outlet pressure is between 2 and 2.5 bar	
4	X	Nitrogen	Inlet pressure not less than 20 psi, note pressure	48 / 48
5	X	CO standard	Outlet pressure is between 2 and 2.5 bar	
6	X	CO standard	Inlet pressure not less than 20 psi, note pressure	39 / 29 CO time synch check @ 08:12:55
		Flows		
7	X	Ozone sample flows	Flow ~ 07. LPM on both channels	
8	X	NOx sample flow	~ 1 LPM	
9	X	NOx Ozonator flow	~ 0.065 LPM	
10	X	CO lamp flow	~ 40 ml/min	
11	X	CO pressure cell	~ 7.5 bar	
12	X	CO pressure monochromator	~ 5 bar	
		Zeros		
13	X	Ozone zero	Performed OK (if not approx zero note values)	
14	X	NOx zero	Performed OK (if not approx zero note values)	
15	X	CO zero	Left for approx 10 min	08:41:45 to 09:55:00
16	X	SO_2 zero (not for most flights)	Left for approx 10 min	.48 lpm
		Other		
17	X	Tubing	All inlets / exhausts connected	
18	X	HORACE data	Check data is being displayed and recorded	
19	No	CO calibration	If unattended set to auto cal (40 min)	
		TDLAS		
20	n/a	230V	230V power breakers on	
21	n/a	28V	Red LED on front panel (ensure LTI breaker on)	
22	n/a	Laptop	On and software working	
23	n/a	Data	Being saved to correct directories	

Post flight

		Switch Off		
1	X	CO	Switch off instrument	
2	X	Ozone	Switch off monitor	
3	X	NOx	Switch off monitor	
4	X	Pumps	Switch off all pumps	
5	X	Breaker	Pop all breakers on rack and SSP	
		Gases (note pressures)		
6	X	CO2/Ar	Close valves and check inlet pressure not below 20 psi	See above for final value
7	X	CO standard	Close valves and check inlet pressure not below 20 psi	See above for final value
8	X	Nitrogen	Close valves and check inlet pressure not below 20 psi	See above for final value
			If below 20 psi then the cylinder needs changing refilling	
		Driers		
9	X	Small drier	Change if spent	
10	X	Large drier	Change if spent	
		TDLAS		
11	n/a	Data transfer	To memory stick	
12	n/a	Laptop	Shut down	
13	n/a	Switch off instrument	Pull all breakers IF no other instrument on	
		Log		
14	X	Flight Log	Put log in folder (notify Ruth of any issues)	
15	None	Faults	Fill out separate log for in flight issues put in flight folder	
16	n/a	TDLAS data	Send to project spaces on BADC	

Chemistry Log

Date: 29 Oct 2008 Flight: B410 Operator: Doug Anderson

In flight

CO calibrations only need carrying out when the lamp temperature changes, if unsure perform a quick cal first.

During each CO calibration check Ozone and NOx flows are similar to those observed pre-flight

Time	Flight level	CO Sensitivity (Hz/ppbV)	CO Bkgrd (ppbV)	CO Bkgrd Count (Hz)	CO Cell Pressure (Torr)	CO Lamp Temp (deg C)
27/10/08 19:55:25	Previous flight for ref.	88.59	339.73	30096.27	-	-
Time	Flight level	CO Sensitivity (Hz/ppbV)	CO Bkgrd (ppbV)	CO Bkgrd Count (Hz)	CO Cell Pressure (Torr)	CO Lamp Temp (deg C)
09:34:32	Ground, pre power c/o	92.26	331.01	30363.60	39.98	7.52
Time	Flight level	CO Sensitivity (Hz/ppbV)	CO Bkgrd (ppbV)	CO Bkgrd Count (Hz)	CO Cell Pressure (Torr)	CO Lamp Temp (deg C)
09:41:03	Ground, pre power c/o	91.58	329.12	30315.17	39.79	7.52
Time	Flight level	CO Sensitivity (Hz/ppbV)	CO Bkgrd (ppbV)	CO Bkgrd Count (Hz)	CO Cell Pressure (Torr)	CO Lamp Temp (deg C)
09:56:37	Ground, during taxi	92.08	326.12	30028.83	40.23	7.50
Time	Flight level	CO Sensitivity (Hz/ppbV)	CO Bkgrd (ppbV)	CO Bkgrd Count (Hz)	CO Cell Pressure (Torr)	CO Lamp Temp (deg C)

Flight level	**Zero Start time**	**Zero End time**	**Counts (Hz)**	**Span Start time**	**Span End time**	**Conc. Range**	**Counts range**	**Pressure Cell** (Torr)	**Lamp Temp**	**O3 Intensities**	
500’	10:30:35	10:31:20	29635 -30060	10:31:35	10:32:15	503-519		92.08	326.12	30028.83	7.50
500’	11:21:24	11:22:16	29165-30115	11:22:24	11:24:19	504-517	76922 - 77765	92.08	326.12	30028.83	7.50
500’	12:07:54	12:09:06	29386 - 30115	12:09:11	12:09:59		77665 - 78491				7.51
500’	13:02:20	13:03:10	29237 - 30011	13:03:13	13:04:26	515-533	77486 - 78744				7.48
4100’	13:49:40	135033	28974 -29538	13:50:45	13:51:30		7713478581				7.51
3600’	14:30:16	14:31:00	28nnn - 29550	14:31:08	14:31:58	511-528	77019278572				7.55
Ground taxi	15:17:06	15:17:50	29176 29590	15:17:52	15:18:45	516-536	77616 78259				7.52
Ground taxi Normal cal	15:2										
Ground, post power changeover	16:52:00	16:53:00	26662 - 27103	16:53:02	16:54:003	489 - 503	72202 - 72555	7.50	40.53	A: 103507 B: 123968	

Time	Flight level	CO Sensitivity (Hz/ppbV)	CO Bkgrd (ppbV)	CO Bkgrd Count (Hz)	CO Cell Pressure (Torr)	CO Lamp Temp (deg C)
Time	Flight level	CO Sensitivity (Hz/ppbV)	CO Bkgrd (ppbV)	CO Bkgrd Count (Hz)	CO Cell Pressure (Torr)	CO Lamp Temp (deg C)
Time	Flight level	CO Sensitivity (Hz/ppbV)	CO Bkgrd (ppbV)	CO Bkgrd Count (Hz)	CO Cell Pressure (Torr)	CO Lamp Temp (deg C)

In flight comments

CLOUD PHYSICS LOG Flight B 410

Date: 29/10/08	Operator: MAP	DRS Time: 08:10:00	DAU1 Time: +0	DAU2 Time: +0	DAU3 Time: +0	Aux1 Time: +0	Aux2 Time: +0	Page 1 of 5

G.M.T	PCASP		FFSSP	SID1	SID2	2D2-C		Manchester FSSP		CIP25			CDP			Habit	Remarks
	Conc/cc	Mean R	Block TX	Count	Count	Conc/L	Max size	Conc/m3	Mean Dia	Conc m3	Max size	LWC	Conc m3	Mean Dia	LWC		
10:02:56	160	0.28	234			8	100	300	12				300	18	0.6	12	FL030
10:04:20	90	0.08	272														FL040
10:04:53	75	0.08															FL050
10:06:09	60	0.08															FL060
10:06:58	45	0.09															FL070
10:08:06	85	0.10															FL080
10:09:02	40	0.08															FL090
10:10:15	35	0.08															End of Profile 1 @ FL100
10:18:03	30	0.08															Start Profile 2 from FL100
10:19:05	45	0.08															FL090
10:19:57	55	0.09															FL080
10:20:52	25	0.08															FL070
10:21:51	25	0.07															FL060
10:22:47	45	0.09															FL050
10:23:49	220	0.22	341			4	75	220	15				190	15	0.3	12	FL040
10:24:58	200	0.09	386														FL030
10:26:17	210	0.09	387														FL020
10:27:20	220	0.09															FL010
10:29:28	250	0.08															End of Profile 1 & Start Profile 2@ 50’
10:30:17																	End of Profile2 & Start Run 1@ 500’
10:31:00	215	0.08															
10:33:00	200	0.08															
10:33:55																	End of Run 1 & Start Run 2.1 @ 500’
10:34:00	190	0.09															
10:36:00	190	0.08															
10:38:00	145	0.09															
10:40:00	145	0.08	408														
10:42:00	120	0.08															
10:44:53																	End of Run 2.1& Start P3
10:45:40	130	0.08															FL010
10:46:31	110	0.08															FL020
10:47:15																	End of Profile 3 @ 3000’
10:48:19																	Start Run 2.2 @ 2500’
10:49:00	140	0.09	422														
10:51:00	110	0.09	442														
10:53:00	110	0.09	445			3	200									12	
10:55:00	100	0.09				2	300									12	
10:57:00	100	0.09	446			2	300									12	
10:59:00																	End of Run & Start P 5
11:00:01																	End of P5 & Start Run 2.3 @ 3500’
11:01:00	280	0.31	648			30	250	100	11			0.3	200	17	0.35	1	
11:03:00	300	0.34	894			20	300	100	12			0.6	200	20	0.6	1	
11:05:00	300	0.38	1178			45	150	100	13			0.4	150	18	0.4	1	

PCASP Reference Volts = 7.7V	FFSSP Reference Volts = 3.4V	2D2-C End element 1 voltage = -1.4V	CIP25 End element 1 voltage = 0.7V	CIP100 End element 1 voltage = n/a
PCASP Flow rate = 1.6 cc/sec		2D2-C End element 32 voltage = -1.4V	CIP25 End element 64 voltage = 0.6V	CIP100 End element 64 voltage = n/a
	SID2 Laser power = n/a	2D2-P End element 1 voltage = n/a		

CLOUD PHYSICS LOG Flight B 410

Date: 29/10/08	Operator: MAP	DRS Time: 08:10:00	DAU1 Time: +0	DAU2 Time: +0	DAU3 Time: +0	Aux1 Time: +0	Aux2 Time: +0	Page 2 of 5

G.M.T	PCASP		FFSSP	SID1	SID2	2D2-C		Manchester FSSP		CIP25			CDP			Habit	Remarks
	Conc/cc	Mean R	Block TX	Count	Count	Conc/L	Max size	Conc/m3	Mean Dia	Conc m3	Max size	LWC	Conc m3	Mean Dia	LWC		
11:07:00	150	0.25	1421			25	200	120	14			0.4	180	17	0.4	1	
11:09:00	90	0.17	1652			9	200	140	14			0.4	160	17	0.35	1	
11:10:51																	End of Run 2.3 & Start Profile 6
11:11:29	890	0.38	2011			60	200	150	20			0.8	150	23	1.1	1	FL040
11:13:06	35	0.07															End of P6 & Start P7 @ FL056
11:13:25	30	0.07	2043														FL050
11:14:25	275	0.35	2118			40	200	100	18			0.8	100	23	0.8	1	FL040
11:15:30	60	0.10	2195			10	200										FL030
11:16:42	75	0.08	2196			1	300									1	FL020
11:17:52	70	0.08				1	700									1	FL010
11:20:35	40	0.08															End of Profile 7 & Start Profile 8 @ 50’
11:21:22																	End of Profile 8 & Start Run 3.1 @ 500’
11:22:00	45	0.08	2197														
11:24:00	70	0.09															
11:26:00	55	0.09															
11:28:00	60	0.09	2198														
11:30:00	65	0.09															
11:32:08																	End of Run 3.1 & Start P9
11:33:10	55	0.08	2199			1											FL010
11:34:17																	End of P9 & Start Run 3.2 @ 2600’
11:35:00	60	0.08	2200			1											
11:37:00	50	0.09	2201			1	250									1	
11:39:00	50	0.10	2202			2	300									1	
11:41:00	60	0.08															
11:43:00	55	0.09	2203			2	300									1	
11:45:14																	End of Run & Start P10
11:47:06																	End of P10 & Start Run 3.3 @ 3900’
11:48:00	150	0.30	2438			30	200	100	12			0.3	100	18	0.3	1	
11:50:00	440	0.31	2651			15	250	100	14			0.35	100	17	0.2	1	
11:52:00	90	0.26	2900			6	150	100	13			0.25	140	17	0.25	1	
11:54:00	55	0.14	3027			7	125	50	10			0.2	120	16	0.15	1	
11:56:00	35	0.13	3124			4	100	100	10			0.2	70	15	0.2	12	
11:57:55																	End of Run 3.3 & Start Profile 11
12:00:04	15	0.09	3277														End of Profile 11 & Start P12 @ 5900’
12:01:03	20	0.08															FL050
12:01:59	65	0.19	3360														FL040
12:02:59	70	0.08															FL030
12:03:55	55	0.09	3361														FL020
12:04:55	80	0.08															FL010
12:07:11	70	0.08															End of P12 & Start P13 @ 50’
12:07:48																	End of P13 & Start Run 4.1 @500’
12:08:00	70	0.09	3362														
12:10:00	65	0.08															

PCASP Reference Volts = 7.7V	FFSSP Reference Volts = 3.4V	2D2-C End element 1 voltage = -1.4V	CIP25 End element 1 voltage = 0.7V	CIP100 End element 1 voltage = n/a
PCASP Flow rate = 1.6 cc/sec		2D2-C End element 32 voltage = -1.4V	CIP25 End element 64 voltage = 0.6V	CIP100 End element 64 voltage = n/a
	SID2 Laser power = n/a	2D2-P End element 1 voltage = n/a		

CLOUD PHYSICS LOG Flight B 410

Date: 29/10/08	Operator: MAP	DRS Time: 08:10:00	DAU1 Time: +0	DAU2 Time: +0	DAU3 Time: +0	Aux1 Time: +0	Aux2 Time: +0	Page 3 of 5

G.M.T	PCASP		FFSSP	SID1	SID2	2D2-C		Manchester FSSP		CIP25			CDP			Habit	Remarks
	Conc/cc	Mean R	Block TX	Count	Count	Conc/L	Max size	Conc/m3	Mean Dia	Conc m3	Max size	LWC	Conc m3	Mean Dia	LWC		
12:12:00	70	0.08	3363														
12:14:00	75	0.08	3364														
12:16:00	60	0.08															
12:18:33																	End of Run 4.1 & Start P14
12:19:18	40	0.09	3366														FL010
12:20:19	50	0.09															FL020
12:21:53	40	0.08															End of P14 @ 3900’
12:23:16																	Start Run 4.3 @ 500’
12:24:00	40	0.08	3527														
12:26:00	40	0.08	3635														
12:28:00	40	0.08															
12:30:00	35	0.08															
12:32:00	35	0.08	3636														
12:33:14																	End of Run & Start P15
12:33:30	35	0.08															FL030
12:34:25	40	0.09															FL040
12:35:20	25	0.08															FL050
12:43:35	5	0.09															FL120
12:44:50	5	0.08															FL130
12:45:48	5	0.07	3659														FL140
12:46:16																	End of P15 & Start P16 @ FL145
12:47:47	8	0.08	3883														FL130
12:48:35	4	0.09															FL120
12:49:33	7	0.08															FL110
12:50:31	14	0.08															FL100
12:51:19	15	0.08															FL090
12:52:14	10	0.08															FL080
12:53:23	15	0.08															FL070
12:54:17	15	0.08															FL060
12:55:15	25	0.08															FL050
12:56:17	80	0.13	3901														FL040
12:57:16	65	0.08	3945														FL030
12:58:14	60	0.08															FL020
12:59:17	60	0.08	3946														FL010
13:01:20	35	0.08															End of Profile 16 & Start P17 @ 50’
13:01:58																	End of P17 & Start Run 5.1 @ 500’
13:02:00	70	0.08															
13:04:00	70	0.08															
13:06:00	55	0.08															
13:08:00	60	0.08															
13:10:00	60	0.08															
13:12:57																	End of Run 5.1 & Start P18
13:13:44	50	0.08															FL010

PCASP Reference Volts = 7.7V	FFSSP Reference Volts = 3.4V	2D2-C End element 1 voltage = -1.4V	CIP25 End element 1 voltage = 0.7V	CIP100 End element 1 voltage = n/a
PCASP Flow rate = 1.6 cc/sec		2D2-C End element 32 voltage = -1.4V	CIP25 End element 64 voltage = 0.6V	CIP100 End element 64 voltage = n/a
	SID2 Laser power = n/a	2D2-P End element 1 voltage = n/a		

CLOUD PHYSICS LOG Flight B 410

Date: 29/10/08	Operator: MAP	DRS Time: 08:10:00	DAU1 Time: +0	DAU2 Time: +0	DAU3 Time: +0	Aux1 Time: +0	Aux2 Time: +0	Page 4 of 5

G.M.T	PCASP		FFSSP	SID1	SID2	2D2-C		Manchester FSSP		CIP25			CDP			Habit	Remarks
	Conc/cc	Mean R	Block TX	Count	Count	Conc/L	Max size	Conc/m3	Mean Dia	Conc m3	Max size	LWC	Conc m3	Mean Dia	LWC		
13:14:35																	End of P18 & Start Run 5.2 @ 1500’
13:15:00	55	0.08	3948														
13:17:00	55	0.09	3949			3	700									1	
13:19:00	50	0.09				1											
13:21:00	40	0.09	3950														
13:23:00	50	0.08															
13:25:00	40	0.10				2	450									1	
13:25:34																	End of Run 5.2 & Start P19
13:28:08																	End of P19 & Start Run 5.3 @ 3900
13:29:00	190	0.32	4072			110	200	50	12			0.2	70	20	0.2	1	
13:31:00	50	0.22	4123			60	275	50	10			0.3	80	20	0.15	1	
13:33:00	50	0.22	4276			60	200	50	13			0.3	70	18	0.1	1	
13:35:00	150	0.41	4371			100	300	60	18			0.6	100	21	0.6	1	
13:37:00	360	0.43	4559			50	475	60	18			0.5	100	21	0.6	1	
13:38:09																	End of Run & Start P20
13:40:31	20	0.08	4715														End of P20 & Start P21 @ FL055
13:41:33	30	0.09															FL050
13:42:12																	End of P21 & Start Run 5.4 @4300’
13:43:00	230	0.39	4872			70	275	70	20			0.6	100	12	0.2	1	
13:45:00	650	0.42	5334			130	300	80	20			0.7	150	12	0.2	1	
13:47:00	615	0.44	5644			140	300	75	20			0.6	150	20	0.4	1	
13:49:00	540	0.44	5893			54	200	100	19			0.8	150	21	0.8	1	
13:51:00	700	0.44	6067			100	225	100	19			0.8	140	22	0.75	1	
13:52:36																	End of Run 5.4 & Start P22
13:54:09	20	0.06	6220														End of P22 & Start P23 @ 5700’
13:54:55	25	0.07															FL050
13:55:52	240	0.38	6345			50	200	100	17							1	FL040
13:57:57	70	0.08	6417														FL020
13:59:05	75	0.08															FL010
14:02:17	70	0.08															End of Profile 23 & Start Profile 24 @ 50’
14:02:49	80	0.08															End of P24 & Start Run 6.1 @ 500’
14:03:00	80	0.08															
14:05:00	100	0.09	6418			1	200										
14:07:00	110	0.08															
14:09:00	120	0.08															
14:11:00	135	0.08															
14:13:40																	End of Run &Start P25
14:14:33	100	0.08															FL010
14:15:27	120	0.08	6419														FL020
14:16:10																	End of P25 & Start Run 6.2 @ 2900’
14:17:00	120	0.09	6420			1	200										
14:19:00	100	0.14	6433			4	200										
14:21:00	90	0.09	6437														

PCASP Reference Volts = 7.7V	FFSSP Reference Volts = 3.4V	2D2-C End element 1 voltage = -1.4V	CIP25 End element 1 voltage = 0.7V	CIP100 End element 1 voltage = n/a
PCASP Flow rate = 1.6 cc/sec		2D2-C End element 32 voltage = -1.4V	CIP25 End element 64 voltage = 0.6V	CIP100 End element 64 voltage = n/a
	SID2 Laser power = n/a	2D2-P End element 1 voltage = n/a		

CLOUD PHYSICS LOG Flight B 410

Date: 29/10/08	Operator: MAP	DRS Time: 08:10:00	DAU1 Time: +0	DAU2 Time: +0	DAU3 Time: +0	Aux1 Time: +0	Aux2 Time: +0	Page 5 of 5

G.M.T	PCASP		FFSSP	SID1	SID2	2D2-C		Manchester FSSP		CIP25			CDP			Habit	Remarks
	Conc/cc	Mean R	Block TX	Count	Count	Conc/L	Max size	Conc/m3	Mean Dia	Conc m3	Max size	LWC	Conc m3	Mean Dia	LWC		
14:23:00	110	0.14	6448			1	200									1	
14:25:00	100	0.09	6459			2	200									1	
14:26:43																	End of Run 6.2 & Start Profile 26
14:28:25																	End of Profile 26 & Start Run 6.3 @ 3800’
14:29:00	180	0.32	6702			45	175	150	12			0.4	200	18	0.5	1	
14:31:00	360	0.39	7093			15	150	200	12			0.5	200	15	0.3	1	
14:33:00	125	0.27	7390			7	150	180	12			0.4	250	12	0.2	1	
14:35:00	100	0.19	7695			10	150	200	12			0.5	250	12	0.2	1	
14:37:00	90	0.22	8108			1	75	250	10			0..3	300	10	0.1	12	
14:39:33																	End of Run 6.3 & Start P27
14:40:43																	End of P27 & Start P28 5
14:41:09	50	0.08	8383														FL050
14:41:52	55	0.10	8464			1	25									12	FL040
14:42:52	150	0.09	8505														FL030
14:43:47	200	0.08															FL020
14:44:47	160	0.08															FL010
14:47:02	200	0.08															End of Profile 28 & Start P29 @ 50 ‘
14:47:38																	End of Profile 29 & Start Run 7.1 @ 500’
14:48:00	180	0.08															
14:50:00	200	0.08															
14:52:00	240	0.08	8506														
14:54:00	210	0.08															
14:56:00	350	0.08															
14:57:32																	End of Run 7.1 & Start P30
14:59:48																	End of P30 & Start Run 7.2
15:00:00	130	0.20	8561			1	25	250	10			0.2	300	10	0.2	12	
15:02:00	120	0.29	10815			2		280	10			0.2	300	10	0.1	12	
15:04:00	160	0.10	10867														
15:06:00	160	0.22	11267			7	50	200	10			0.3	300	12	0.2	12	
15:08:00	110	0.21	12130			8	50	300	10			0.3	300	12	0.2	12	
15:09:51																	End of Run
	Maybe channel 1 noise on PCASP due to slight leak																

PCASP Reference Volts = 7.7V	FFSSP Reference Volts = 3.4V	2D2-C End element 1 voltage = -1.4V	CIP25 End element 1 voltage = 0.7V	CIP100 End element 1 voltage = n/a
PCASP Flow rate = 1.6 cc/sec		2D2-C End element 32 voltage = -1.4V	CIP25 End element 64 voltage = 0.6V	CIP100 End element 64 voltage = n/a
	SID2 Laser power = n/a	2D2-P End element 1 voltage = n/a		

P.S.A.P. Log

Flight No. **B**410 Date 27 Oct 08 Page 1 of .. operator

GMT	Filter Trans.	Flow Rate	B_a x 10^{-6}	Ph_det levels		Run	Remarks
Set to DRS time: done 092407Z	New filter Tr = 1.000 done	Set to 3.0 lpm: N/A	.0	17	44	Ave =30 s	←Preflight
10:20:30	1.014		.0	17	44		pump off cloud
10:25:00	1.007		23.5	17	44		pump on
10:37:30	.997		.0	17	44		pump off
11:15:47	.996		9.4	17	44		pump on
11:42:41	.989		1.0	17	44		pump off
12:04:40	.988		8.2	17	44		pump on
12:55:00	.984		24.5	17	44		pump off
12:28:30	.983		8.8	17	44		pump on
13:25:36	.977		.0	17	44		pump off
13:50:00	.977		4.3	17	44		pump on (flight mangers still off)
14:27:00	.970		.0	16	44		pump off
14:47							pump on
14:57:30	.964		.0	16	44		pump off

Flight No: B410 **Date: 29/10/08** **Operator:D Tiddeman**

Type of filters mounted in	Upper inlet:	Lower inlet:

Disk No 1 (top)	Disk No 2 (middle)	Disk No 3 (bottom)	Inlet Upper/ Lower	Time Pump On	Time Pump Off	Run	Accum Vol [l]	Comments eg. Filter Exposure No, period in cloud, change of level etc.
21	23	83	U	11:35:00	11:44:06	R3.2	0,473	Below cloud
2	1	1e2	U	12:23:50	12:33:27	R4.2	0,482	Below cloud
8	7	140	U	13:14:55	13:25:26	R5.2	0,627	Below cloud
				14:16:17	14:26:37	R6.2	627,1178	Below cloud
3	4		L	10:30:17	10:45:19	Run 1/2.1?	0,1055	500ft
33	40	117	L	11:17:50	11:32:40	R3.1	0,959	500ft
				12:08:05	12:19:10	R4.1	1313,2036	500ft
10	69	49	L	13:02:05	13;11:59	R5.1	0,688	500ft
				14:03:09	14:13:49	R6.1	1108,1836	500ft
				14:47:40	14:57:30	R7.1	2140,2794	500ft

Size	#	Charged	Flight/Date	Discharged
10 1	2 1	27/10	B410/29/10 (ICMR)	HC 30/10
10 1	8 7	27/10	B410/29/10	HC 3/10
10 1	3 4	28/10	B410/29/10	HC 30/10
10 1	21 23	28/10	B410/29/10	HC 30/10
10 1	33 40	28/10	B410/29/10	HC 30/10
10 1	10 69	28/10	B410/29/10	HC 30/10

filter No	LOC	TON	TOFF	RUN	Acc Vol	Total Vol

CVI log

10/29/08 8:46:00 AM
10/29/08 8:50:50 AM
10/29/08 9:23:42 AM
10/29/08 9:32:57 AM preflight probs: aparent ca
10/29/08 9:33:08 AM preflight probs: aparent ca
10/29/08 9:38:55 AM test at begining - lyman - counterflow to zero - get one reading - swap over get a higher reading.
10/29/08 9:39:02 AM shouldn't they be the same/
10/29/08 9:41:57 AM shouldn't they be the same/
10/29/08 9:42:00 AM shouldn't they be the same/
10/29/08 10:08:58 AM shouldn't they be the same/
10/29/08 10:10:09 AM All zero with low counter flow cntl (2) on high transit, there for no cabin leaks??
10/29/08 10:13:33 AM cf to 1 cf valve closed, aerosol mode
10/29/08 10:14:26 AM cf to 1 cf valve closed, aerosol mode
10/29/08 10:14:36 AM cf to 1 cf valve closed, aerosol mode
10/29/08 10:14:41 AM cf to 1 cf valve closed, aerosol mode
10/29/08 10:16:21 AM cf to 1 cf valve closed, aerosol mode
10/29/08 10:23:34 AM cloud cf on
10/29/08 10:25:09 AM cf off, aerosol mode
10/29/08 10:41:43 AM PCASP generaly agreeing with cloud physics
10/29/08 10:44:53 AM cf mode ready for cal
10/29/08 10:45:16 AM cf mode ready for cal
10/29/08 10:45:28 AM cf mode ready for cal
10/29/08 10:45:37 AM cf mode ready for cal
10/29/08 10:46:16 AM cf at 3.8, dials set 0.72 and 0,6
10/29/08 10:47:34 AM cf at 3.8, dials set 0.72 and 0,6
10/29/08 10:47:43 AM droppinf, in cloud
10/29/08 10:49:04 AM more cloud,
10/29/08 10:56:05 AM CF of 6 to get flat line, ish
10/29/08 10:56:18 AM hygro to zero.
10/29/08 10:58:55 AM hygro to zero.
10/29/08 10:59:26 AM drizzle reported, cf back 4& go for cloud
10/29/08 10:59:52 AM drizzle reported, cf back 4& go for cloud
10/29/08 10:59:57 AM in cloud
10/29/08 11:00:55 AM hygo back to sample
10/29/08 11:01:15 AM AMS seeing lots of high masses.
10/29/08 11:10:48 AM manchester reporting 0.3 to 0.5 water content.
10/29/08 11:11:23 AM climbing above cloud, leave in cf mode to check zero
10/29/08 11:12:01 AM cloud break
10/29/08 11:13:48 AM Manchester to rosemount momentary, back down to cloud.
10/29/08 11:14:05 AM Manchester to rosemount momentary, back down to cloud.
10/29/08 11:14:13 AM in cloud
10/29/08 11:15:36 AM cloud base: now 3.1k
10/29/08 11:16:43 AM AMS were seeing distibution peak at 10's of nanometers, small leak to cabin, maybe on interack pipe.
10/29/08 11:17:49 AM zero not comin below cloud. maybe drissle again?
10/29/08 11:18:45 AM rain, on front screen
10/29/08 11:20:02 AM leave cf mode.
10/29/08 11:21:16 AM aerosol mode
10/29/08 11:22:14 AM zero bit poor down to 50ft. got much better lower we got.
10/29/08 11:22:48 AM cloud physics reporting large drizzle droplets below cloud.
10/29/08 11:28:51 AM drizzle
10/29/08 11:34:05 AM climbing for just blow cloud base run, cloud base varialbe
10/29/08 11:35:46 AM PCSP counts much higher here, this is why cannot zero below cloud.
10/29/08 11:39:20 AM drizzle seen occasionaly
10/29/08 11:43:20 AM drizzle or cloud base.
10/29/08 11:44:01 AM CF mode
10/29/08 11:44:08 AM CF mode
10/29/08 11:44:12 AM CF mode
10/29/08 11:44:27 AM lots of drizzle
10/29/08 11:45:54 AM manchester to CVI
10/29/08 11:46:27 AM no zero beforecloud due to drizzle.
10/29/08 11:46:52 AM patchy cloud.
10/29/08 11:47:14 AM in cloud run
10/29/08 11:52:34 AM cloud thin and patchy

10/29/08 11:53:17 AM AMS seeing 20nm peak, high masses and sulphates
10/29/08 11:53:43 AM clear spots
10/29/08 12:00:27 PM AMS on Rosemount dial to zero
10/29/08 12:00:47 PM AMS on Rosemount dial to zero
10/29/08 12:01:02 PM guess same for sp2.
10/29/08 12:01:58 PM cf to 3
10/29/08 12:02:07 PM cf to 3
10/29/08 12:02:40 PM out of cloud, variable cloud base.
10/29/08 12:03:01 PM out of cloud, variable cloud base.
10/29/08 12:05:21 PM aerosol mode
10/29/08 12:15:25 PM cloud physics gicing approx 55c/cc
10/29/08 12:18:49 PM climb to below patchy cloud run
10/29/08 12:21:30 PM pcasp flow tweeked
10/29/08 12:25:30 PM doing a below inversion run instead of below cloud. Not enough cloud.
10/29/08 12:27:41 PM core cloud pcasp seening 40 per cc
10/29/08 12:32:18 PM profile to 10000, no cloud above so leave in aerosol mode.
10/29/08 12:55:34 PM cf on for cloud
10/29/08 12:55:40 PM cloud
10/29/08 12:59:29 PM cf off, aerosol mode
10/29/08 1:06:34 PM core cloud agees with pcasp 50-60c/cc
10/29/08 1:11:25 PM drizzle
10/29/08 1:15:35 PM below cloud run, big peaks, drizzle?
10/29/08 1:24:03 PM cf mode on for in cloud run
10/29/08 1:24:36 PM cf mode on for in cloud run
10/29/08 1:25:14 PM manchester flow set ready
10/29/08 1:27:38 PM cloud
10/29/08 1:28:06 PM maybe drizzle just before entering cloud
10/29/08 1:39:21 PM leave in cf mode above cloud, check zero.
10/29/08 1:41:45 PM ok zero above cloud
10/29/08 1:42:02 PM back in cloud
10/29/08 1:52:17 PM interesting saw tooth stucture on hygro
10/29/08 1:53:40 PM above cloud
10/29/08 1:54:55 PM reasonable zero, occasional particles <10
10/29/08 1:55:02 PM reasonable zero, occasional particles <10
10/29/08 1:55:22 PM cloud
10/29/08 1:58:41 PM manchester to rosemount
10/29/08 1:58:52 PM manchester to rosemount
10/29/08 1:59:07 PM cf off aerosol mode
10/29/08 2:05:16 PM manchester dials to zero, forgot earlier
10/29/08 2:16:32 PM drizzle
10/29/08 2:21:19 PM dropping to avoid cloud
10/29/08 2:21:35 PM back up...
10/29/08 2:21:52 PM cloud
10/29/08 2:22:34 PM ignore lasr cloud call
10/29/08 2:24:20 PM cloud
10/29/08 2:25:55 PM cf on ready for cloud run
10/29/08 2:26:11 PM cf on ready for cloud run
10/29/08 2:27:23 PM cloud
10/29/08 2:34:37 PM cloud thinning.
10/29/08 2:39:41 PM climb above cloud, check zero.
10/29/08 2:40:02 PM cloud free
10/29/08 2:42:01 PM ok zero just before cloud tops
10/29/08 2:42:07 PM cloud.
10/29/08 2:44:24 PM good zero now
10/29/08 2:45:27 PM cf off aerosol mode.
10/29/08 2:51:45 PM tweeked PCASP flows.
10/29/08 2:57:45 PM cf mode ready for profile to cloud run
10/29/08 2:59:54 PM patch cloud run
10/29/08 3:04:32 PM cf left on in manchester mode for landing.
10/29/08 3:23:04 PM hygro t valve to zero
10/29/08 3:26:02 PM hygro t valve to zero
10/29/08 3:26:39 PM PCASP zero easy when hygro switched to diluant??
10/29/08 3:26:46 PM All off

ARIES flight log

Flight: B710 | page 1 of 1

Date: 29/OCT/'08 | Operator(s): S. Rogers | Res: 1 | Gain A: 2 B: 2

Loc./Notes: Vocas, 20°

Scans: either "[IGMs]X[co-adds]", or "[stop DRS time]" if in start/stop, or "[macro name]". View: mirror angle.

DRS time	Flt ptrn	Scans	View	Shtr	HBB	CBB	Comments
08 10	On the ground						Power On. CBB at 40°C
08 38 50			CH	C	71	34	ColdHot 1min script
10 00	Take off						
10 29 55	500 ft		NZ	O	71	30	Nad Zen Long Run 30 sec.
	R1						8/8 cloud above
10 33 50	R2.1						Bank right, continuing run
10 44	P4↑			<	71	32	Abort ol script for profile
10 47	2500 ft		NZ	O	71	31	Nad Zen Long Run 30 sec. Just below cloud.
	R2.2						EoR 10 59
11 21	R3.1 500 ft		NZ	O	71	27	Nad Zen Long Run 30 sec. Below cloud.
11 32 08	EoR ↑						
11 34 17	R3.2 2000 ft		NZ	O	71	29	Nad Zen Long Run 30 sec. Just below cloud
11 45	P10 ↑						
12 07 47	R4.1 500 ft		NZ	O	71	26	Nad Zen Long Run 30 sec. Some gaps in the cloud above
12 18 45	↑ 500 ft		CH	C	70	30	
12 22	↘ 3000 ft		NZ	O	71	31	Nad Zen Long Run 30 sec. Patchy cloud above
12 33 23	↑		CH	C	71	31	ColdHot 1min script
12 51			N	C	71	31	Nadir Long Run 3min Stopped 12 53
13 01 58	R5.1 500 ft		NZ	O	71	31	~~Nad Zen Long Run~~ 3min script
13 12 57	EoR ↑						
13 14 52	R5.2 1500?		NZ	O	70	31	Nad Zen Long Run 30 sec.
13 25	EoR ↑			C	71	31	—
14 02 47	R6.1 500 ft		NZ	O	71	31	Nad Zen Long Run 30 sec.
14 13	EoR			C	71	31	—
14 16 10	R6.2 2900		NZ	O	71	31	Nad Zen Long Run 30 sec.
14 26	EoR			C	71	31	— @50ft: "bird,"!
14 47 32	R7.1 500 ft		NZ	O	71	31	Nad Zen Long Run 30 sec.
14 57	EoR.			C	71	31	

Wet Nephelometer Log

Flight No **B**..410 Date .29/10/08. Operator's name D Tiddeman…… Page .1..... of .....

GMT	Run	Height	Sample flow	Dry neph RH	Wet neph RH	Temp ramp	T_{water}	Remarks
10:15:20		10kft	10.0	10.3	37.4	10	20	dry neph on asrl2,com2 chiller on
10:32:30	R1	500ft	13.5	46.1	37.4	45	10	
10:38:30	R2.1	500ft	13.6	47.8	81.7	10	42	
11:21:19	R3.1	500ft	13.6	41.9	43.2	45	10	
11:23 -11:30								Software died restarted
11:32:40	R3.1		13.0	41.9	73.8	5	45	
11:40:30	R3.2	2000ft	12.9	38	50.2	40	19	
11:45:43	R3.2	2000ft	12.6	41.9	71.3	10	39	
11:48								Chiller off
12:00:30			11.7	4.1	45.1			Chiller on
12:09:15	R4.1	500ft	13.5	44.5	44.2	40	13	
12:15:50	R4.1	500ft	13.4	41.9	73.4	10	39	
12:25:10	R4.2	3000ft	12.3	35.4	42.4	42	16	
12:34:30			11.6	31.8	75	5	42	
12:39:50								Chiller off
12:56:20								Chiller on
13:03:50	R5.1	500ft	13.4	42.5	40.1	42	14	
13:09:45	R5.1	500ft	13.3	51.3	80.6	7	42	
13:15:50	R5.2	1500ft	12.9	39.0	51.7	45	22	
13:22:50	R5.2	1500ft	12.8	37	83.1	6	43	
14:05:40	R6.1	500ft	13.3	39	37	45	7	
14:12:20	R6.1	500ft	13.3	39.3	82.3	7.5	45	

Wet Nephelometer Log

Flight No **B**.409..... Date ..... Operator's name: …… Page ..... of .....

GMT	Run	Height	Sample flow	Dry neph RH	Wet neph RH	Temp ramp	T_{water}	Remarks
14:18:10	R6.2	2900ft	12.3	34.7	54.8	45	24	
14:23:00	R6.2		12.2	37.3	82.5	7	45	
14:48:51	R7.1	500ft	13.2	42.9	39.5	43	9	
14:55:10	R7.1	500ft	13.0	43.8	81.5	6	43	

B410_SWS_SHIMS_EventLog.txt

```
05:13:12.36  ---      -     -     -     -
05:13:12.36  ---      -     -     -     -  +++ SOFTWARE START/RESTART +++
05:13:12.36  ---      -     -     -     -  +++ hh:mm:ss.ff / Instr / Posn / Period /
                                            tVIS/ tNIR / Comment +++
05:13:12.36  ---      -     -     -     -  +++ Flight no. B410
05:13:12.36  ---      -     -     -     -
05:13:15.24  SWS      -     -     -     5  NIR int.time changed from 5ms to 5ms.
05:13:26.61  SWS      -     -     -     -  Initialization: VIS OK NIR OK
05:13:26.70  USH      -     -     -     -  Initialization: VIS OK NIR OK
05:13:26.79  LSH      -     -     -     -  Initialization: VIS OK NIR OK
05:13:33.71  SWS      -   100     -     -  Sample period changed from 250ms to 100ms.
05:13:37.58  SWS      -     -    30     -  VIS int.time changed from 5ms to 30ms.
05:13:37.59  SWS      -     -     -    30  NIR int.time changed from 5ms to 30ms.
05:13:40.39  USH      -   100     -     -  Sample period changed from 250ms to 100ms.
05:13:46.33  USH      -     -     -     5  NIR int.time changed from 5ms to 5ms.
05:13:49.28  USH      -     -    30     -  VIS int.time changed from 5ms to 30ms.
05:13:49.29  USH      -     -     -    30  NIR int.time changed from 5ms to 30ms.
05:13:51.76  LSH      -   100     -     -  Sample period changed from 250ms to 100ms.
05:13:53.50  LSH      -     -     -     5  NIR int.time changed from 5ms to 5ms.
05:13:58.07  LSH      -     -    30     -  VIS int.time changed from 5ms to 30ms.
05:13:58.08  LSH      -     -     -    30  NIR int.time changed from 5ms to 30ms.
05:14:05.98  SWS      -     -     -     -  Manual scene recording started.
05:14:05.98  LSH      -     -     -     -  Manual scene recording started.
05:14:05.98  USH      -     -     -     -  Manual scene recording started.
05:14:09.86  SWS      -     -     -     -  Idling
05:14:09.87  LSH      -     -     -     -  Idling
05:14:09.88  USH      -     -     -     -  Idling
05:14:15.71  ---      -     -     -     -  *** 16 deg
05:14:33.21  ---      -     -     -     -  Reset shutters.
05:15:14.73  SWS      -     -     -     -  Telescope motor initialised.
05:15:16.80  SWS      -     -     -     -  Telescope disabled.
05:15:33.01  SWS      -     -     -     -  Telescope motor initialised.
05:15:40.15  SWS    0.0     -     -     -  Telescope sent to -6.000
05:15:58.31  SWS   -6.0     -     -     -  Telescope sent to 100.000
05:15:59.42  SWS   99.9     -     -     -  Telescope stopped.
05:16:02.40  SWS      -     -     -     -  Manual scene recording started.
05:16:02.85  SWS      -     -     -     -  Idling
05:16:06.56  SWS      -     -     -     -  Manual scene recording started.
05:16:06.56  LSH      -     -     -     -  Manual scene recording started.
05:16:06.57  USH      -     -     -     -  Manual scene recording started.
05:16:14.63  ---      -     -     -     -  Reset shutters.
05:16:19.47  USH      -     -     -     -  Dark measurement started.
05:16:19.53  LSH      -     -     -     -  Dark measurement started.
05:16:19.56  SWS      -     -     -     -  Dark measurement started.
05:16:20.20  USH      -     -     -     -  Manual scene recording started.
05:16:20.40  LSH      -     -     -     -  Manual scene recording started.
05:16:20.66  SWS      -     -     -     -  Manual scene recording started.
05:16:22.28  LSH      -     -     -     -  Dark measurement started.
05:16:22.28  SWS      -     -     -     -  Dark measurement started.
05:16:22.34  USH      -     -     -     -  Dark measurement started.
05:16:23.03  LSH      -     -     -     -  Manual scene recording started.
05:16:23.23  SWS      -     -     -     -  Manual scene recording started.
05:16:23.46  USH      -     -     -     -  Manual scene recording started.
05:16:29.69  SWS      -     -     -     -  Idling
05:16:29.74  USH      -     -     -     -  Idling
05:16:29.75  LSH      -     -     -     -  Idling
05:16:29.78  LSH      -     -     -     -  Idling
05:16:35.43  ---      -     -     -     -  *** 15 deg
05:18:49.15  ---      -     -     -     -  *** 14 deg
05:23:17.18  ---      -     -     -     -  *** 13 deg
05:25:40.73  ---      -     -     -     -  *** 12 deg
05:30:04.84  ---      -     -     -     -  *** 11 deg
05:32:24.51  ---      -     -     -     -  *** 12
05:40:30.84  ---      -     -     -     -  *** 12 deg
05:40:36.51  SWS      -     -     -     -  Manual scene recording started.
05:40:36.52  LSH      -     -     -     -  Manual scene recording started.
05:40:36.53  USH      -     -     -     -  Manual scene recording started.
```

```
05:40:40.95  LSH      -     -     -     -  Idling
05:40:41.01  USH      -     -     -     -  Idling
05:40:41.04  SWS      -     -     -     -  Idling
05:40:43.46  ---      -     -     -     -  Reset shutters.
05:57:48.33  ---      -     -     -     -  *** 11 deg
06:22:58.52  ---      -     -     -     -  *** 10 deg
06:23:10.72  SWS      -     -     -     -  Manual scene recording started.
06:23:10.72  LSH      -     -     -     -  Manual scene recording started.
06:23:10.73  USH      -     -     -     -  Manual scene recording started.
06:23:17.88  ---      -     -     -     -  Reset shutters.
06:23:23.27  ---      -     -     -     -  Reset shutters.
06:23:28.55  SWS      -     -     -     -  Dark measurement started.
06:23:28.56  LSH      -     -     -     -  Dark measurement started.
06:23:28.62  USH      -     -     -     -  Dark measurement started.
06:23:29.33  SWS      -     -     -     -  Manual scene recording started.
06:23:29.54  LSH      -     -     -     -  Manual scene recording started.
06:23:29.73  USH      -     -     -     -  Manual scene recording started.
06:23:54.56  LSH      -     -     -     -  Dark measurement started.
06:23:54.61  SWS      -     -     -     -  Dark measurement started.
06:23:54.61  USH      -     -     -     -  Dark measurement started.
06:23:55.07  SWS      -     -     -     -  Dark measurement started.
06:23:55.22  USH      -     -     -     -  Dark measurement started.
06:23:55.36  LSH      -     -     -     -  Manual scene recording started.
06:23:55.93  SWS      -     -     -     -  Idling
06:23:56.18  USH      -     -     -     -  Idling
06:24:00.06  SWS      -     -     -     -  Manual scene recording started.
06:24:00.06  USH      -     -     -     -  Manual scene recording started.
06:27:16.67  ---      -     -     -     -  *** 10 degt
06:28:59.81  ---      -     -     -     -  Reset shutters.
06:29:08.71  ---      -     -     -     -  Reset shutters.
06:29:13.21  LSH      -     -     -     -  Dark measurement started.
06:29:13.96  LSH      -     -     -     -  Manual scene recording started.
06:29:15.85  USH      -     -     -     -  Dark measurement started.
06:29:16.61  USH      -     -     -     -  Manual scene recording started.
06:29:17.62  SWS      -     -     -     -  Dark measurement started.
06:29:18.40  SWS      -     -     -     -  Manual scene recording started.
06:29:20.18  LSH      -     -     -     -  Dark measurement started.
06:29:20.96  LSH      -     -     -     -  Manual scene recording started.
06:29:22.39  USH      -     -     -     -  Dark measurement started.
06:29:23.18  USH      -     -     -     -  Manual scene recording started.
06:29:24.19  SWS      -     -     -     -  Dark measurement started.
06:29:24.94  SWS      -     -     -     -  Manual scene recording started.
06:29:27.18  LSH      -     -     -     -  Dark measurement started.
06:29:27.95  LSH      -     -     -     -  Manual scene recording started.
06:29:28.89  USH      -     -     -     -  Dark measurement started.
06:29:29.63  USH      -     -     -     -  Manual scene recording started.
06:29:31.50  SWS      -     -     -     -  Dark measurement started.
06:29:32.55  SWS      -     -     -     -  Manual scene recording started.
06:29:39.25  LSH      -     -    50     -  VIS int.time changed from 30ms to 50ms.
06:29:39.25  LSH      -     -     -    50  NIR int.time changed from 30ms to 50ms.
06:29:43.34  USH      -     -    50     -  VIS int.time changed from 30ms to 50ms.
06:29:43.34  USH      -     -     -    50  NIR int.time changed from 30ms to 50ms.
06:29:45.69  LSH      -     -     -     -  Dark measurement started.
06:29:46.69  LSH      -     -     -     -  Manual scene recording started.
06:29:47.40  USH      -     -     -     -  Dark measurement started.
06:29:48.38  USH      -     -     -     -  Manual scene recording started.
06:29:49.40  LSH      -     -     -     -  Dark measurement started.
06:29:50.36  LSH      -     -     -     -  Manual scene recording started.
06:29:51.06  USH      -     -     -     -  Dark measurement started.
06:29:52.01  USH      -     -     -     -  Manual scene recording started.
06:29:53.69  SWS      -     -     -     -  Dark measurement started.
06:29:54.44  SWS      -     -     -     -  Manual scene recording started.
06:44:21.11  ---      -     -     -     -  Reset shutters.
06:44:24.97  SWS      -     -     -     -  Dark measurement started.
06:44:25.71  SWS      -     -     -     -  Manual scene recording started.
06:44:30.79  LSH      -     -     -     -  Dark measurement started.
06:44:31.80  LSH      -     -     -     -  Manual scene recording started.
06:44:34.66  USH      -     -     -     -  Dark measurement started.
06:44:35.62  USH      -     -     -     -  Manual scene recording started.
```

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07:01:09.22  SWS      -     -   100     -  VIS int.time changed from 30ms to 100ms.
07:01:09.23  SWS      -     -     -   100  NIR int.time changed from 30ms to 100ms.
07:01:13.42  USH      -     -   100     -  VIS int.time changed from 50ms to 100ms.
07:01:13.42  USH      -     -     -   100  NIR int.time changed from 50ms to 100ms.
07:01:17.09  LSH      -     -   100     -  VIS int.time changed from 50ms to 100ms.
07:01:17.10  LSH      -     -     -   100  NIR int.time changed from 50ms to 100ms.
07:01:20.25  LSH      -     -   600     -  VIS int.time changed from 100ms to 600ms.
07:01:20.26  LSH      -     -     -   600  NIR int.time changed from 100ms to 600ms.
07:01:25.56  USH      -     -   200     -  VIS int.time changed from 100ms to 200ms.
07:01:25.56  USH      -     -     -   200  NIR int.time changed from 100ms to 200ms.
07:01:29.52  SWS      -     -   300     -  VIS int.time changed from 100ms to 300ms.
07:01:29.53  SWS      -     -     -   300  NIR int.time changed from 100ms to 300ms.
07:01:33.35  SWS      -     -   200     -  VIS int.time changed from 300ms to 200ms.
07:01:33.36  SWS      -     -     -   200  NIR int.time changed from 300ms to 200ms.
07:01:35.38  SWS  100.0     -     -     -  Telescope sent to -6.000
07:01:36.53  SWS   -5.9     -     -     -  Telescope stopped.
07:01:40.35  ---      -     -     -     -  Reset shutters.
07:01:45.96  SWS      -     -     -     -  Dark measurement started.
07:01:48.41  SWS      -     -     -     -  Manual scene recording started.
07:01:49.55  USH      -     -     -     -  Dark measurement started.
07:01:51.99  USH      -     -     -     -  Manual scene recording started.
07:01:53.39  LSH      -     -     -     -  Dark measurement started.
07:01:59.83  LSH      -     -     -     -  Manual scene recording started.
07:02:06.17  ---      -     -     -     -  *** 9 deg
07:05:40.32  SWS      -     -     -     -  Dark measurement started.
07:05:42.76  USH      -     -     -     -  Dark measurement started.
07:05:42.79  SWS      -     -     -     -  Manual scene recording started.
07:05:45.17  LSH      -     -     -     -  Dark measurement started.
07:05:45.22  USH      -     -     -     -  Manual scene recording started.
07:05:51.64  LSH      -     -     -     -  Manual scene recording started.
07:08:07.47  ---      -     -     -     -  *** 11 deg
07:09:05.45  USH      -     -    50     -  VIS int.time changed from 200ms to 50ms.
07:09:05.46  USH      -     -     -    50  NIR int.time changed from 200ms to 50ms.
07:09:07.39  USH      -     -     -     -  Dark measurement started.
07:09:08.39  USH      -     -     -     -  Manual scene recording started.
07:09:12.58  SWS      -     -    50     -  VIS int.time changed from 200ms to 50ms.
07:09:12.58  SWS      -     -     -    50  NIR int.time changed from 200ms to 50ms.
07:09:13.99  SWS      -     -     -     -  Dark measurement started.
07:09:14.94  SWS      -     -     -     -  Manual scene recording started.
07:09:16.27  USH      -     -     -     -  Dark measurement started.
07:09:17.23  USH      -     -     -     -  Manual scene recording started.
07:09:19.48  LSH      -     -     -     -  Dark measurement started.
07:09:25.94  LSH      -     -     -     -  Manual scene recording started.
07:09:41.82  ---      -     -     -     -  *** 11 deg
07:11:38.80  SWS      -     -     -     -  Dark measurement started.
07:11:39.77  SWS      -     -     -     -  Manual scene recording started.
07:11:41.85  USH      -     -     -     -  Dark measurement started.
07:11:42.84  USH      -     -     -     -  Manual scene recording started.
07:11:45.03  LSH      -     -     -     -  Dark measurement started.
07:11:47.88  ---      -     -     -     -  Reset shutters.
07:11:51.48  LSH      -     -     -     -  Manual scene recording started.
07:12:39.86  ---      -     -     -     -  *** 12 deg
07:12:57.72  USH      -     -     -     -  Dark measurement started.
07:12:58.72  USH      -     -     -     -  Manual scene recording started.
07:12:59.73  SWS      -     -     -     -  Dark measurement started.
07:13:00.69  SWS      -     -     -     -  Manual scene recording started.
07:14:09.24  ---      -     -     -     -  *** 13 deg
07:16:09.27  SWS      -     -     -     -  Dark measurement started.
07:16:10.26  SWS      -     -     -     -  Manual scene recording started.
07:16:10.74  SWS   -6.0     -     -     -  Telescope sent to 174.000
07:16:12.43  SWS  171.0     -     -     -  Telescope stopped.
07:16:27.78  SWS      -     -     -     -  Dark measurement started.
07:16:28.73  SWS      -     -     -     -  Manual scene recording started.
07:17:11.15  SWS      -     -     -     -  Dark measurement started.
07:17:12.12  SWS      -     -     -     -  Manual scene recording started.
07:17:12.96  USH      -     -     -     -  Dark measurement started.
07:17:13.94  USH      -     -     -     -  Manual scene recording started.
07:17:15.42  LSH      -     -     -     -  Dark measurement started.
07:17:21.88  LSH      -     -     -     -  Manual scene recording started.
```

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07:17:45.46  SWS      -     -     -     -  Dark measurement started.
07:17:46.40  SWS      -     -     -     -  Manual scene recording started.
07:17:47.18  USH      -     -     -     -  Dark measurement started.
07:17:48.13  USH      -     -     -     -  Manual scene recording started.
07:20:26.03  SWS      -     -     -     -  Dark measurement started.
07:20:26.98  SWS      -     -     -     -  Manual scene recording started.
07:20:28.49  USH      -     -     -     -  Dark measurement started.
07:20:29.43  USH      -     -     -     -  Manual scene recording started.
07:20:30.86  LSH      -     -     -     -  Dark measurement started.
07:20:37.31  LSH      -     -     -     -  Manual scene recording started.
07:23:59.75  SWS      -     -     -     -  Dark measurement started.
07:24:00.71  SWS      -     -     -     -  Manual scene recording started.
07:24:01.33  SWS  174.0     -     -     -  Telescope sent to -6.000
07:24:03.06  SWS   -5.1     -     -     -  Telescope stopped.
07:24:04.65  SWS      -     -     -     -  Dark measurement started.
07:24:05.64  SWS      -     -     -     -  Manual scene recording started.
07:24:06.32  USH      -     -     -     -  Dark measurement started.
07:24:07.35  USH      -     -     -     -  Manual scene recording started.
07:24:08.19  LSH      -     -     -     -  Dark measurement started.
07:24:10.86  SWS      -     -     -     -  Dark measurement started.
07:24:11.81  SWS      -     -     -     -  Manual scene recording started.
07:24:12.85  USH      -     -     -     -  Dark measurement started.
07:24:13.81  USH      -     -     -     -  Manual scene recording started.
07:24:14.68  LSH      -     -     -     -  Manual scene recording started.
07:24:22.18  LSH      -     -     -     -  Dark measurement started.
07:24:28.63  LSH      -     -     -     -  Manual scene recording started.
07:25:44.36  SWS      -     -     -     -  Dark measurement started.
07:25:45.31  SWS      -     -     -     -  Manual scene recording started.
07:25:46.40  USH      -     -     -     -  Dark measurement started.
07:25:47.36  USH      -     -     -     -  Manual scene recording started.
07:25:48.21  LSH      -     -     -     -  Dark measurement started.
07:25:54.69  LSH      -     -     -     -  Manual scene recording started.
07:28:05.25  SWS      -     -     -     -  Dark measurement started.
07:28:06.20  SWS      -     -     -     -  Manual scene recording started.
07:28:07.76  USH      -     -     -     -  Dark measurement started.
07:28:08.72  USH      -     -     -     -  Manual scene recording started.
07:28:10.07  LSH      -     -     -     -  Dark measurement started.
07:28:16.52  LSH      -     -     -     -  Manual scene recording started.
07:31:05.87  SWS      -     -     -     -  Dark measurement started.
07:31:06.83  SWS      -     -     -     -  Manual scene recording started.
07:31:07.50  USH      -     -     -     -  Dark measurement started.
07:31:08.46  USH      -     -     -     -  Manual scene recording started.
07:31:11.07  LSH      -     -     -     -  Dark measurement started.
07:31:17.57  LSH      -     -     -     -  Manual scene recording started.
07:31:54.19  ---      -     -     -     -  *** 12 deg
07:32:39.19  SWS      -     -     -     -  Dark measurement started.
07:32:40.14  SWS      -     -     -     -  Manual scene recording started.
07:32:40.76  USH      -     -     -     -  Dark measurement started.
07:32:41.73  USH      -     -     -     -  Manual scene recording started.
07:32:43.35  LSH      -     -     -     -  Dark measurement started.
07:32:49.80  LSH      -     -     -     -  Manual scene recording started.
07:36:51.31  SWS      -     -     -     -  Dark measurement started.
07:36:52.29  SWS      -     -     -     -  Manual scene recording started.
07:36:54.62  USH      -     -     -     -  Dark measurement started.
07:36:55.58  USH      -     -     -     -  Manual scene recording started.
07:36:56.71  LSH      -     -     -     -  Dark measurement started.
07:37:03.20  LSH      -     -     -     -  Manual scene recording started.
07:37:52.07  ---      -     -     -     -  *** 11 deg
07:38:40.23  SWS      -     -     -     -  Dark measurement started.
07:38:41.20  SWS      -     -     -     -  Manual scene recording started.
07:38:41.75  USH      -     -     -     -  Dark measurement started.
07:38:42.70  USH      -     -     -     -  Manual scene recording started.
07:38:43.66  LSH      -     -     -     -  Dark measurement started.
07:38:50.12  LSH      -     -     -     -  Manual scene recording started.
07:41:08.76  SWS      -     -     -     -  Idling
07:41:08.77  USH      -     -     -     -  Idling
07:41:08.85  LSH      -     -     -     -  Idling
07:41:11.56  SWS   -6.0     -     -     -  Telescope sent to -6.000
07:41:16.41  SWS   -6.0     -     -     -  Telescope sent to 174.000
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07:41:18.12  SWS  173.3     -     -     -  Telescope stopped.
07:41:19.89  SWS      -     -     -     -  Manual scene recording started.
07:41:19.89  USH      -     -     -     -  Manual scene recording started.
07:41:19.90  LSH      -     -     -     -  Manual scene recording started.
07:41:24.27  SWS      -     -     -     -  Dark measurement started.
07:41:25.25  SWS      -     -     -     -  Manual scene recording started.
07:41:26.10  USH      -     -     -     -  Dark measurement started.
07:41:27.05  USH      -     -     -     -  Manual scene recording started.
07:41:28.63  LSH      -     -     -     -  Dark measurement started.
07:41:35.10  LSH      -     -     -     -  Manual scene recording started.
07:41:49.01  USH      -     -     -     -  Idling
07:41:49.01  SWS      -     -     -     -  Idling
07:41:49.05  LSH      -     -     -     -  Idling
07:41:49.09  LSH      -     -     -     -  Idling
07:41:50.84  SWS  174.0     -     -     -  Telescope sent to -6.000
07:41:52.53  SWS   -2.5     -     -     -  Telescope stopped.
07:41:53.53  SWS      -     -     -     -  Manual scene recording started.
07:41:53.54  LSH      -     -     -     -  Manual scene recording started.
07:41:53.55  USH      -     -     -     -  Manual scene recording started.
07:41:55.72  SWS      -     -     -     -  Dark measurement started.
07:41:56.73  SWS      -     -     -     -  Manual scene recording started.
07:41:57.64  USH      -     -     -     -  Dark measurement started.
07:41:58.59  USH      -     -     -     -  Manual scene recording started.
07:41:59.56  LSH      -     -     -     -  Dark measurement started.
07:42:06.00  LSH      -     -     -     -  Manual scene recording started.
07:42:33.71  SWS      -     -     -     -  Dark measurement started.
07:42:34.67  SWS      -     -     -     -  Manual scene recording started.
07:42:37.17  SWS      -     -     -     -  Idling
07:42:37.17  USH      -     -     -     -  Idling
07:42:37.38  LSH      -     -     -     -  Idling
07:42:39.24  ---      -     -     -     -  Reset shutters.
07:42:42.48  ---      -     -     -     -  Reset shutters.
07:42:45.72  LSH      -     -     -     -  Dark measurement started.
07:42:45.73  USH      -     -     -     -  Dark measurement started.
07:42:45.75  SWS      -     -     -     -  Dark measurement started.
07:42:46.87  USH      -     -     -     -  Idling
07:42:47.06  SWS      -     -     -     -  Idling
07:42:48.26  SWS      -     -     -     -  Manual scene recording started.
07:42:48.26  USH      -     -     -     -  Manual scene recording started.
07:42:52.16  LSH      -     -     -     -  Idling
07:42:56.91  SWS      -     -    35     -  VIS int.time changed from 50ms to 35ms.
07:42:56.92  SWS      -     -     -    35  NIR int.time changed from 50ms to 35ms.
07:42:58.16  SWS      -     -     -     -  Dark measurement started.
07:42:58.97  SWS      -     -     -     -  Manual scene recording started.
07:43:01.01  SWS      -     -    75     -  VIS int.time changed from 35ms to 75ms.
07:43:01.02  SWS      -     -     -    75  NIR int.time changed from 35ms to 75ms.
07:43:04.13  SWS      -     -     -     -  Dark measurement started.
07:43:05.33  SWS      -     -     -     -  Manual scene recording started.
07:43:28.65  ---      -     -     -     -  Reset shutters.
07:43:31.89  ---      -     -     -     -  Reset shutters.
07:44:21.24  ---      -     -     -     -
07:44:21.24  ---      -     -     -     -  +++ SOFTWARE START/RESTART +++
07:44:21.24  ---      -     -     -     -  +++ hh:mm:ss.ff / Instr / Posn / Period /
                                            tVIS/ tNIR / Comment +++
07:44:21.24  ---      -     -     -     -  +++ Flight no. B410
07:44:21.24  ---      -     -     -     -
07:44:32.35  SWS      -     -     -     -  Initialization: VIS OK NIR OK
07:44:32.44  USH      -     -     -     -  Initialization: VIS OK NIR OK
07:44:32.53  LSH      -     -     -     -  Initialization: VIS OK NIR OK
07:44:35.87  SWS      -     -     -     5  NIR int.time changed from 5ms to 5ms.
07:44:38.57  SWS      -     -    45     -  VIS int.time changed from 5ms to 45ms.
07:44:38.58  SWS      -     -     -    45  NIR int.time changed from 5ms to 45ms.
07:44:42.69  SWS      -   100     -     -  Sample period changed from 250ms to 100ms.
07:44:45.60  USH      -   100     -     -  Sample period changed from 250ms to 100ms.
07:44:52.74  USH      -     -     -     5  NIR int.time changed from 5ms to 5ms.
07:44:55.36  USH      -     -    50     -  VIS int.time changed from 5ms to 50ms.
07:44:55.37  USH      -     -     -    50  NIR int.time changed from 5ms to 50ms.
07:44:59.44  SWS      -     -    50     -  VIS int.time changed from 45ms to 50ms.
07:44:59.44  SWS      -     -     -    50  NIR int.time changed from 45ms to 50ms.
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07:45:02.11	LSH	-	100	-	-	Sample period changed from 250ms to 100ms.
07:45:03.25	LSH	-	-	-	5	NIR int.time changed from 5ms to 5ms.
07:45:06.47	LSH	-	-	200	-	VIS int.time changed from 5ms to 200ms.
07:45:06.47	LSH	-	-	-	200	NIR int.time changed from 5ms to 200ms.
07:45:08.52	SWS	-	-	-	-	Manual scene recording started.
07:45:08.52	LSH	-	-	-	-	Manual scene recording started.
07:45:08.54	USH	-	-	-	-	Manual scene recording started.
07:45:35.41	SWS	-	-	-	-	Dark measurement started.
07:45:35.70	SWS	-	-	-	-	Warning: Abnormally bright dark measurement.
07:45:36.38	SWS	-	-	-	-	Manual scene recording started.
07:45:40.60	---	-	-	-	-	Reset shutters.
07:45:44.81	SWS	-	-	-	-	Dark measurement started.
07:45:45.77	SWS	-	-	-	-	Manual scene recording started.
07:45:46.71	USH	-	-	-	-	Dark measurement started.
07:45:47.66	USH	-	-	-	-	Manual scene recording started.
07:45:48.63	LSH	-	-	-	-	Dark measurement started.
07:45:50.69	SWS	-	-	-	-	Dark measurement started.
07:45:51.11	LSH	-	-	-	-	Manual scene recording started.
07:45:51.67	SWS	-	-	-	-	Manual scene recording started.
07:45:57.04	USH	-	-	-	-	Idling
07:45:57.12	SWS	-	-	-	-	Idling
07:45:57.15	SWS	-	-	-	-	Idling
07:45:57.15	LSH	-	-	-	-	Idling
07:45:59.17	SWS	-	-	-	-	Manual scene recording started.
07:45:59.18	LSH	-	-	-	-	Manual scene recording started.
07:45:59.18	USH	-	-	-	-	Manual scene recording started.
07:46:01.50	USH	-	-	-	-	Dark measurement started.
07:46:02.44	USH	-	-	-	-	Manual scene recording started.
07:46:03.37	LSH	-	-	-	-	Dark measurement started.
07:46:05.81	LSH	-	-	-	-	Manual scene recording started.
07:46:12.64	SWS	-	-	-	-	Telescope motor initialised.
07:46:19.17	SWS	-	-	-	-	Telescope disabled.
07:46:29.68	SWS	-	-	-	-	Telescope motor initialised.
07:46:32.46	SWS	-0.0	-	-	-	Telescope sent to -6.000
07:46:35.82	SWS	-	-	-	-	Dark measurement started.
07:46:36.87	SWS	-	-	-	-	Manual scene recording started.
07:46:38.83	USH	-	-	-	-	Dark measurement started.
07:46:39.77	USH	-	-	-	-	Manual scene recording started.
07:46:40.37	LSH	-	-	-	-	Dark measurement started.
07:46:43.04	LSH	-	-	-	-	Manual scene recording started.
07:46:43.46	LSH	-	-	-	-	Manual scene recording started.
07:47:12.15	---	-	-	-	-	*** had to restart instrument as SWS VIS suddenly dropped out around 7.40
07:47:19.56	---	-	-	-	-	*** 12 deg
07:48:19.65	---	-	-	-	-	*** run at 2500 ft
07:50:52.61	---	-	-	-	-	*** for some reason about time has set time to local not zulu
07:51:04.50	---	-	-	-	-	*** zulu is locar plus 3 hours
07:53:43.70	---	-	-	-	-	*** 13 deg
07:55:08.78	SWS	-	-	-	-	Dark measurement started.
07:55:09.06	SWS	-	-	-	-	Warning: Abnormally bright dark measurement.
07:55:09.74	SWS	-	-	-	-	Manual scene recording started.
07:55:13.38	---	-	-	-	-	Reset shutters.
07:55:18.15	SWS	-	-	-	-	Dark measurement started.
07:55:19.10	SWS	-	-	-	-	Manual scene recording started.
07:55:20.23	USH	-	-	-	-	Dark measurement started.
07:55:21.25	USH	-	-	-	-	Manual scene recording started.
07:55:22.35	LSH	-	-	-	-	Dark measurement started.
07:55:24.81	LSH	-	-	-	-	Manual scene recording started.
07:55:25.45	SWS	-	-	-	-	Dark measurement started.
07:55:26.40	SWS	-	-	-	-	Manual scene recording started.
07:55:27.22	USH	-	-	-	-	Dark measurement started.
07:55:28.17	USH	-	-	-	-	Manual scene recording started.
07:55:30.69	LSH	-	-	-	-	Dark measurement started.
07:55:33.14	LSH	-	-	-	-	Manual scene recording started.
07:57:32.23	SWS	-	-	-	-	Dark measurement started.
07:57:32.51	SWS	-	-	-	-	Warning: Abnormally bright dark measurement.
07:57:33.19	SWS	-	-	-	-	Manual scene recording started.
07:57:40.73	LSH	-	-	-	-	Idling

```
07:57:40.81  USH      -     -     -     -  Idling
07:57:40.86  SWS      -     -     -     -  Idling
07:57:42.33  ---      -     -     -     -  Reset shutters.
07:57:45.54  SWS      -     -     -     -  Manual scene recording started.
07:57:45.55  LSH      -     -     -     -  Manual scene recording started.
07:57:45.58  USH      -     -     -     -  Manual scene recording started.
07:57:46.17  LSH      -     -     -     -  Manual scene recording started.
07:57:46.27  USH      -     -     -     -  Manual scene recording started.
07:57:47.18  USH      -     -     -     -  Dark measurement started.
07:57:47.23  SWS      -     -     -     -  Dark measurement started.
07:57:47.26  LSH      -     -     -     -  Dark measurement started.
07:57:48.12  USH      -     -     -     -  Manual scene recording started.
07:57:48.33  SWS      -     -     -     -  Manual scene recording started.
07:57:50.02  LSH      -     -     -     -  Manual scene recording started.
07:57:52.90  LSH      -     -     -     -  Dark measurement started.
07:57:52.94  USH      -     -     -     -  Dark measurement started.
07:57:52.97  SWS      -     -     -     -  Dark measurement started.
07:57:54.03  USH      -     -     -     -  Manual scene recording started.
07:57:54.25  SWS      -     -     -     -  Manual scene recording started.
07:57:55.39  LSH      -     -     -     -  Manual scene recording started.
08:01:16.59  ---      -     -     -     -  *** 1
08:01:16.65  LSH      -     -     -     -  Idling
08:01:16.69  SWS      -     -     -     -  Idling
08:01:16.69  USH      -     -     -     -  Idling
08:01:24.04  ---      -     -     -     -  *** 14  deg
08:02:07.38  SWS      -     -     -     -  Manual scene recording started.
08:02:07.38  LSH      -     -     -     -  Manual scene recording started.
08:02:07.39  USH      -     -     -     -  Manual scene recording started.
08:02:11.55  USH      -     -     -     -  Dark measurement started.
08:02:12.49  USH      -     -     -     -  Manual scene recording started.
08:02:14.01  SWS      -     -     -     -  Dark measurement started.
08:02:14.97  SWS      -     -     -     -  Manual scene recording started.
08:02:32.99  ---      -     -     -     -  *** 14 deg
08:03:04.81  USH      -     -     -     -  Idling
08:03:04.81  SWS      -     -     -     -  Idling
08:03:04.86  LSH      -     -     -     -  Idling
08:03:06.80  SWS   -6.0     -     -     -  Telescope sent to 174.000
08:03:08.47  SWS  173.2     -     -     -  Telescope stopped.
08:03:09.00  ---      -     -     -     -  Reset shutters.
08:03:14.00  SWS      -     -     -     -  Manual scene recording started.
08:03:14.01  LSH      -     -     -     -  Manual scene recording started.
08:03:14.01  USH      -     -     -     -  Manual scene recording started.
08:03:16.71  SWS      -     -     -     -  Dark measurement started.
08:03:17.66  SWS      -     -     -     -  Manual scene recording started.
08:03:17.98  USH      -     -     -     -  Dark measurement started.
08:03:18.95  USH      -     -     -     -  Manual scene recording started.
08:03:19.77  LSH      -     -     -     -  Dark measurement started.
08:03:22.25  LSH      -     -     -     -  Manual scene recording started.
08:06:03.73  USH      -     -     -     -  Idling
08:06:03.75  LSH      -     -     -     -  Idling
08:06:03.76  SWS      -     -     -     -  Idling
08:06:05.48  SWS  174.0     -     -     -  Telescope sent to -6.000
08:06:07.14  SWS   -1.6     -     -     -  Telescope stopped.
08:06:09.75  ---      -     -     -     -  Reset shutters.
08:06:14.23  LSH      -     -     -     -  Manual scene recording started.
08:06:14.24  USH      -     -     -     -  Manual scene recording started.
08:06:14.24  SWS      -     -     -     -  Manual scene recording started.
08:06:16.36  USH      -     -     -     -  Manual scene sampling started - Not Recording!
08:06:16.43  SWS      -     -     -     -  Manual scene sampling started - Not Recording!
08:06:16.46  LSH      -     -     -     -  Manual scene sampling started - Not Recording!
08:06:19.04  SWS      -     -     -     -  Manual scene recording started.
08:06:19.12  LSH      -     -     -     -  Manual scene recording started.
08:06:19.42  USH      -     -     -     -  Manual scene recording started.
08:06:21.99  USH      -     -     -     -  Dark measurement started.
08:06:22.09  SWS      -     -     -     -  Dark measurement started.
08:06:22.13  LSH      -     -     -     -  Dark measurement started.
08:06:22.96  USH      -     -     -     -  Manual scene recording started.
08:06:23.14  SWS      -     -     -     -  Manual scene recording started.
08:06:24.83  LSH      -     -     -     -  Manual scene recording started.
```

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08:06:48.42  ---      -     -     -     -  *** 14 deg
08:10:55.32  ---      -     -     -     -  *** profile climb
08:11:11.14  USH      -     -     -     -  Idling
08:11:11.22  SWS      -     -     -     -  Idling
08:11:11.30  LSH      -     -     -     -  Idling
08:11:12.94  SWS   -6.0     -     -     -  Telescope sent to 174.000
08:11:14.59  SWS  169.1     -     -     -  Telescope stopped.
08:11:14.66  ---      -     -     -     -  Reset shutters.
08:11:17.88  LSH      -     -     -     -  Manual scene recording started.
08:11:17.88  SWS      -     -     -     -  Manual scene recording started.
08:11:17.91  USH      -     -     -     -  Manual scene recording started.
08:11:18.60  USH      -     -     -     -  Manual scene recording started.
08:11:22.47  SWS      -     -     -     -  Dark measurement started.
08:11:22.50  USH      -     -     -     -  Dark measurement started.
08:11:22.54  LSH      -     -     -     -  Dark measurement started.
08:11:23.45  SWS      -     -     -     -  Manual scene recording started.
08:11:23.63  USH      -     -     -     -  Manual scene recording started.
08:11:25.32  LSH      -     -     -     -  Manual scene recording started.
08:12:15.21  LSH      -     -     -     -  Dark measurement started.
08:12:17.66  LSH      -     -     -     -  Manual scene recording started.
08:12:18.89  USH      -     -     -     -  Dark measurement started.
08:12:19.83  USH      -     -     -     -  Manual scene recording started.
08:12:20.90  SWS      -     -     -     -  Dark measurement started.
08:12:21.84  SWS      -     -     -     -  Manual scene recording started.
08:12:41.62  ---      -     -     -     -  *** 14 deg
08:12:57.58  ---      -     -     -     -  *** profile descent
08:15:41.37  ---      -     -     -     -  *** cloud base around 3.1
08:16:08.96  USH      -     -     -     -  Dark measurement started.
08:16:09.04  SWS      -     -     -     -  Dark measurement started.
08:16:09.11  LSH      -     -     -     -  Dark measurement started.
08:16:09.92  USH      -     -     -     -  Manual scene recording started.
08:16:10.17  SWS      -     -     -     -  Manual scene recording started.
08:16:11.85  LSH      -     -     -     -  Manual scene recording started.
08:16:13.38  USH      -     -     -     -  Dark measurement started.
08:16:13.40  SWS      -     -     -     -  Dark measurement started.
08:16:13.44  LSH      -     -     -     -  Dark measurement started.
08:16:14.37  USH      -     -     -     -  Manual scene recording started.
08:16:14.55  SWS      -     -     -     -  Manual scene recording started.
08:16:16.23  LSH      -     -     -     -  Manual scene recording started.
08:20:48.10  LSH      -     -     -     -  Idling
08:20:48.13  SWS      -     -     -     -  Idling
08:20:48.14  USH      -     -     -     -  Idling
08:20:51.15  SWS  174.0     -     -     -  Telescope sent to -6.000
08:20:52.84  SWS   -2.6     -     -     -  Telescope stopped.
08:20:53.62  ---      -     -     -     -  Reset shutters.
08:20:56.86  USH      -     -     -     -  Manual scene recording started.
08:20:56.86  LSH      -     -     -     -  Manual scene recording started.
08:20:56.88  SWS      -     -     -     -  Manual scene recording started.
08:20:57.58  SWS      -     -     -     -  Manual scene recording started.
08:21:00.24  SWS      -     -     -     -  Dark measurement started.
08:21:01.20  SWS      -     -     -     -  Manual scene recording started.
08:21:03.00  USH      -     -     -     -  Dark measurement started.
08:21:03.95  USH      -     -     -     -  Manual scene recording started.
08:21:04.87  LSH      -     -     -     -  Dark measurement started.
08:21:06.89  SWS      -     -     -     -  Dark measurement started.
08:21:07.31  LSH      -     -     -     -  Manual scene recording started.
08:21:07.86  SWS      -     -     -     -  Manual scene recording started.
08:21:08.75  USH      -     -     -     -  Dark measurement started.
08:21:09.69  USH      -     -     -     -  Manual scene recording started.
08:21:10.42  LSH      -     -     -     -  Dark measurement started.
08:21:12.88  LSH      -     -     -     -  Manual scene recording started.
08:21:17.91  ---      -     -     -     -  *** run at 5oo ft
08:21:25.70  ---      -     -     -     -  *** run 3.1
08:30:53.09  ---      -     -     -     -  *** 13 deg
08:31:58.90  SWS      -     -     -     -  Dark measurement started.
08:31:59.85  SWS      -     -     -     -  Manual scene recording started.
08:32:00.80  USH      -     -     -     -  Dark measurement started.
08:32:02.48  USH      -     -     -     -  Manual scene recording started.
08:32:02.96  LSH      -     -     -     -  Dark measurement started.
```

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08:32:05.44  LSH      -     -     -     -  Manual scene recording started.
08:32:17.38  ---      -     -     -     -  *** profile climb (9)
08:34:19.24  ---      -     -     -     -  *** below cloud run at 2000 ft
08:34:30.97  ---      -     -     -     -  *** run 3.2
08:38:52.62  ---      -     -     -     -  *** 13 deg
08:39:06.31  SWS      -     -     -     -  Dark measurement started.
08:39:07.26  SWS      -     -     -     -  Manual scene recording started.
08:39:08.19  USH      -     -     -     -  Dark measurement started.
08:39:09.13  USH      -     -     -     -  Manual scene recording started.
08:43:46.83  ---      -     -     -     -  *** 12 deg
08:45:01.05  USH      -     -     -     -  Dark measurement started.
08:45:02.00  USH      -     -     -     -  Manual scene recording started.
08:45:03.18  SWS      -     -     -     -  Dark measurement started.
08:45:04.14  SWS      -     -     -     -  Manual scene recording started.
08:45:05.60  LSH      -     -     -     -  Dark measurement started.
08:45:08.04  LSH      -     -     -     -  Manual scene recording started.
08:49:36.80  SWS      -     -     -     -  Dark measurement started.
08:49:37.75  SWS      -     -     -     -  Manual scene recording started.
08:49:38.99  USH      -     -     -     -  Dark measurement started.
08:49:39.94  USH      -     -     -     -  Manual scene recording started.
08:49:40.91  LSH      -     -     -     -  Dark measurement started.
08:49:43.37  LSH      -     -     -     -  Manual scene recording started.
08:52:22.06  LSH      -     -     -     -  Dark measurement started.
08:52:22.10  SWS      -     -     -     -  Dark measurement started.
08:52:22.18  USH      -     -     -     -  Dark measurement started.
08:52:23.26  SWS      -     -     -     -  Manual scene recording started.
08:52:23.48  USH      -     -     -     -  Manual scene recording started.
08:52:24.53  LSH      -     -     -     -  Manual scene recording started.
08:52:39.34  USH      -     -     -     -  Dark measurement started.
08:52:39.42  SWS      -     -     -     -  Dark measurement started.
08:52:39.51  LSH      -     -     -     -  Dark measurement started.
08:52:40.31  USH      -     -     -     -  Manual scene recording started.
08:52:40.56  SWS      -     -     -     -  Manual scene recording started.
08:52:42.19  LSH      -     -     -     -  Manual scene recording started.
08:58:27.87  ---      -     -     -     -  *** 11 deg
09:00:27.29  SWS      -     -     -     -  Idling
09:00:27.31  LSH      -     -     -     -  Idling
09:00:27.34  USH      -     -     -     -  Idling
09:00:29.47  SWS   -6.0     -     -     -  Telescope sent to 174.000
09:00:31.14  SWS  170.0     -     -     -  Telescope stopped.
09:00:31.88  LSH      -     -     -     -  Manual scene recording started.
09:00:31.88  USH      -     -     -     -  Manual scene recording started.
09:00:31.89  SWS      -     -     -     -  Manual scene recording started.
09:04:26.10  SWS      -     -     -     -  Idling
09:04:26.12  LSH      -     -     -     -  Idling
09:04:26.23  USH      -     -     -     -  Idling
09:04:27.64  ---      -     -     -     -  Reset shutters.
09:04:33.00  SWS      -     -     -     -  Manual scene recording started.
09:04:33.01  LSH      -     -     -     -  Manual scene recording started.
09:04:33.01  USH      -     -     -     -  Manual scene recording started.
09:04:34.70  USH      -     -     -     -  Dark measurement started.
09:04:34.77  SWS      -     -     -     -  Dark measurement started.
09:04:34.81  LSH      -     -     -     -  Dark measurement started.
09:04:35.64  USH      -     -     -     -  Manual scene recording started.
09:04:35.84  SWS      -     -     -     -  Manual scene recording started.
09:04:37.55  LSH      -     -     -     -  Manual scene recording started.
09:04:38.80  SWS      -     -     -     -  Dark measurement started.
09:04:38.85  USH      -     -     -     -  Dark measurement started.
09:04:38.86  LSH      -     -     -     -  Dark measurement started.
09:04:39.75  SWS      -     -     -     -  Manual scene recording started.
09:04:40.02  USH      -     -     -     -  Manual scene recording started.
09:04:41.65  LSH      -     -     -     -  Manual scene recording started.
09:05:57.86  ---      -     -     -     -  *** boundary layer decoupling, q below stratq
                                             layer
09:06:10.42  ---      -     -     -     -  *** a lot of inhomegeinity in cloud
09:06:24.49  SWS      -     -     -     -  Idling
09:06:24.51  USH      -     -     -     -  Idling
09:06:24.54  LSH      -     -     -     -  Idling
09:06:24.56  SWS      -     -     -     -  Idling
```

09:06:25.77	SWS	174.0	-	-	-	Telescope sent to -6.000
09:06:27.51	SWS	-5.8	-	-	-	Telescope stopped.
09:06:28.78	SWS	-	-	-	-	Manual scene recording started.
09:06:28.78	LSH	-	-	-	-	Manual scene recording started.
09:06:28.79	USH	-	-	-	-	Manual scene recording started.
09:06:31.20	SWS	-	-	-	-	Dark measurement started.
09:06:32.16	SWS	-	-	-	-	Manual scene recording started.
09:06:33.22	USH	-	-	-	-	Dark measurement started.
09:06:34.17	USH	-	-	-	-	Manual scene recording started.
09:06:35.44	LSH	-	-	-	-	Dark measurement started.
09:06:37.89	LSH	-	-	-	-	Manual scene recording started.
09:07:55.52	---	-	-	-	-	*** run at 500 ft below cloud
09:07:58.85	---	-	-	-	-	*** run 4.1
09:15:31.36	---	-	-	-	-	*** 10 deg
09:16:35.40	---	-	-	-	-	*** 11 deg
09:16:42.65	---	-	-	-	-	*** broken cloud above
09:18:18.88	USH	-	-	-	-	Dark measurement started.
09:18:19.91	USH	-	-	-	-	Manual scene recording started.
09:18:20.24	USH	-	-	-	-	Manual scene recording started.
09:18:21.14	SWS	-	-	-	-	Dark measurement started.
09:18:22.11	SWS	-	-	-	-	Manual scene recording started.
09:18:23.55	LSH	-	-	-	-	Dark measurement started.
09:18:26.02	LSH	-	-	-	-	Manual scene recording started.
09:18:26.46	SWS	-	-	-	-	Dark measurement started.
09:18:27.43	SWS	-	-	-	-	Manual scene recording started.
09:18:28.01	USH	-	-	-	-	Dark measurement started.
09:18:28.99	USH	-	-	-	-	Manual scene recording started.
09:18:40.01	---	-	-	-	-	*** climbing to 3900 ft
09:18:52.89	---	-	-	-	-	*** corection 39000
09:21:55.99	---	-	-	-	-	*** run at 39000 in almost cloud free/ scattered cloud conditions
09:22:42.98	---	-	-	-	-	*** recommenceing run at 3000 ft
09:22:52.44	---	-	-	-	-	*** to be below inversion
09:23:12.88	---	-	-	-	-	*** start of run now
09:23:19.30	---	-	-	-	-	*** 12 deg
09:27:46.69	SWS	-	-	-	-	Dark measurement started.
09:27:47.68	SWS	-	-	-	-	Manual scene recording started.
09:27:48.62	USH	-	-	-	-	Dark measurement started.
09:27:49.61	USH	-	-	-	-	Manual scene recording started.
09:27:50.58	LSH	-	-	-	-	Dark measurement started.
09:27:53.06	LSH	-	-	-	-	Manual scene recording started.
09:27:53.84	SWS	-	-	-	-	Dark measurement started.
09:27:54.79	SWS	-	-	-	-	Manual scene recording started.
09:27:55.89	USH	-	-	-	-	Dark measurement started.
09:27:56.84	USH	-	-	-	-	Manual scene recording started.
09:27:57.76	LSH	-	-	-	-	Dark measurement started.
09:28:00.23	LSH	-	-	-	-	Manual scene recording started.
09:28:35.41	LSH	-	-	50	-	VIS int.time changed from 200ms to 50ms.
09:28:35.42	LSH	-	-	-	50	NIR int.time changed from 200ms to 50ms.
09:28:37.55	LSH	-	-	-	-	Dark measurement started.
09:28:38.53	LSH	-	-	-	-	Manual scene recording started.
09:28:40.11	LSH	-	-	-	-	Dark measurement started.
09:28:41.09	LSH	-	-	-	-	Manual scene recording started.
09:29:37.38	---	-	-	-	-	*** 13 deg
09:32:24.69	---	-	-	-	-	*** 14 deg
09:32:44.26	SWS	-	-	-	-	Dark measurement started.
09:32:45.25	SWS	-	-	-	-	Manual scene recording started.
09:32:46.07	USH	-	-	-	-	Dark measurement started.
09:32:47.04	USH	-	-	-	-	Manual scene recording started.
09:32:48.13	LSH	-	-	-	-	Dark measurement started.
09:32:49.08	LSH	-	-	-	-	Manual scene recording started.
09:33:17.08	---	-	-	-	-	*** end of run
09:33:22.48	---	-	-	-	-	*** profile climb
09:40:11.17	---	-	-	-	-	*** 13
09:42:37.67	SWS	-	-	-	-	Dark measurement started.
09:42:38.63	SWS	-	-	-	-	Manual scene recording started.
09:42:38.96	USH	-	-	-	-	Dark measurement started.
09:42:39.92	USH	-	-	-	-	Manual scene recording started.
09:44:16.07	USH	-	-	-	-	Dark measurement started.

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09:44:17.03  USH      -     -     -     -  Manual scene recording started.
09:44:17.96  SWS      -     -     -     -  Dark measurement started.
09:44:18.90  SWS      -     -     -     -  Manual scene recording started.
09:45:22.83  SWS      -     -     -     -  Dark measurement started.
09:45:23.78  SWS      -     -     -     -  Manual scene recording started.
09:45:24.80  USH      -     -     -     -  Dark measurement started.
09:45:25.87  USH      -     -     -     -  Manual scene recording started.
09:45:26.19  USH      -     -     -     -  Manual scene recording started.
09:45:27.96  LSH      -     -     -     -  Dark measurement started.
09:45:28.90  LSH      -     -     -     -  Manual scene recording started.
09:45:34.04  LSH      -     -   100     -  VIS int.time changed from 50ms to 100ms.
09:45:34.05  LSH      -     -     -   100  NIR int.time changed from 50ms to 100ms.
09:45:35.90  LSH      -     -     -     -  Dark measurement started.
09:45:37.34  LSH      -     -     -     -  Manual scene recording started.
09:45:42.39  LSH      -     -   200     -  VIS int.time changed from 100ms to 200ms.
09:45:42.40  LSH      -     -     -   200  NIR int.time changed from 100ms to 200ms.
09:45:47.61  LSH      -     -     -     -  Dark measurement started.
09:45:50.08  LSH      -     -     -     -  Manual scene recording started.
09:45:51.63  LSH      -     -     -     -  Dark measurement started.
09:45:54.08  LSH      -     -     -     -  Manual scene recording started.
09:46:00.04  USH      -     -     -     -  Idling
09:46:00.07  SWS      -     -     -     -  Idling
09:46:00.10  LSH      -     -     -     -  Idling
09:46:02.14  SWS   -6.0     -     -     -  Telescope sent to 174.000
09:46:03.84  SWS  172.3     -     -     -  Telescope stopped.
09:46:05.84  USH      -     -     -     -  Manual scene recording started.
09:46:05.85  LSH      -     -     -     -  Manual scene recording started.
09:46:05.85  SWS      -     -     -     -  Manual scene recording started.
09:46:08.79  SWS      -     -     -     -  Dark measurement started.
09:46:08.89  USH      -     -     -     -  Dark measurement started.
09:46:08.94  LSH      -     -     -     -  Dark measurement started.
09:46:09.76  SWS      -     -     -     -  Manual scene recording started.
09:46:09.96  USH      -     -     -     -  Manual scene recording started.
09:46:11.68  LSH      -     -     -     -  Manual scene recording started.
09:46:25.10  ---      -     -     -     -  *** descending
09:46:33.92  ---      -     -     -     -  *** profile 16
09:47:23.92  USH      -     -     -     -  Dark measurement started.
09:47:23.94  SWS      -     -     -     -  Dark measurement started.
09:47:23.98  LSH      -     -     -     -  Dark measurement started.
09:47:24.90  USH      -     -     -     -  Manual scene recording started.
09:47:25.12  SWS      -     -     -     -  Manual scene recording started.
09:47:26.85  LSH      -     -     -     -  Manual scene recording started.
09:48:56.12  LSH      -     -   400     -  VIS int.time changed from 200ms to 400ms.
09:48:56.13  LSH      -     -     -   400  NIR int.time changed from 200ms to 400ms.
09:49:11.13  USH      -     -     -     -  Dark measurement started.
09:49:11.18  SWS      -     -     -     -  Dark measurement started.
09:49:11.29  LSH      -     -     -     -  Dark measurement started.
09:49:12.11  USH      -     -     -     -  Manual scene recording started.
09:49:12.30  SWS      -     -     -     -  Manual scene recording started.
09:49:16.03  LSH      -     -     -     -  Manual scene recording started.
09:49:18.72  ---      -     -     -     -  *** 12 deg
09:49:24.09  SWS      -     -     -     -  Dark measurement started.
09:49:24.14  USH      -     -     -     -  Dark measurement started.
09:49:24.28  LSH      -     -     -     -  Dark measurement started.
09:49:25.05  SWS      -     -     -     -  Manual scene recording started.
09:49:25.30  USH      -     -     -     -  Manual scene recording started.
09:49:28.96  LSH      -     -     -     -  Manual scene recording started.
09:51:09.07  SWS      -     -     -     -  Dark measurement started.
09:51:09.15  USH      -     -     -     -  Dark measurement started.
09:51:09.22  LSH      -     -     -     -  Dark measurement started.
09:51:10.04  SWS      -     -     -     -  Manual scene recording started.
09:51:10.28  USH      -     -     -     -  Manual scene recording started.
09:51:13.94  LSH      -     -     -     -  Manual scene recording started.
09:51:51.71  SWS      -     -     -     -  Dark measurement started.
09:51:51.80  USH      -     -     -     -  Dark measurement started.
09:51:51.89  LSH      -     -     -     -  Dark measurement started.
09:51:52.74  SWS      -     -     -     -  Manual scene recording started.
09:51:52.88  USH      -     -     -     -  Manual scene recording started.
09:51:56.63  LSH      -     -     -     -  Manual scene recording started.
```

09:52:03.44	SWS	-	-	30	-	VIS int.time changed from 50ms to 30ms.
09:52:03.45	SWS	-	-	-	30	NIR int.time changed from 50ms to 30ms.
09:52:04.74	SWS	-	-	-	-	Dark measurement started.
09:52:05.48	SWS	-	-	-	-	Manual scene recording started.
09:52:06.92	SWS	-	-	-	-	Dark measurement started.
09:52:07.67	SWS	-	-	-	-	Manual scene recording started.
09:52:09.71	USH	-	-	-	-	Dark measurement started.
09:52:09.74	SWS	-	-	-	-	Dark measurement started.
09:52:09.93	LSH	-	-	-	-	Dark measurement started.
09:52:10.68	SWS	-	-	-	-	Manual scene recording started.
09:52:10.80	USH	-	-	-	-	Manual scene recording started.
09:52:14.58	LSH	-	-	-	-	Manual scene recording started.
09:53:28.85	---	-	-	-	-	*** 11 deg
09:55:55.87	---	-	-	-	-	*** passing through cloud
09:56:28.04	---	-	-	-	-	*** below cloud
09:56:31.94	USH	-	-	-	-	Dark measurement started.
09:56:31.97	SWS	-	-	-	-	Dark measurement started.
09:56:32.00	LSH	-	-	-	-	Dark measurement started.
09:56:32.91	USH	-	-	-	-	Manual scene recording started.
09:56:32.93	SWS	-	-	-	-	Manual scene recording started.
09:56:36.80	LSH	-	-	-	-	Manual scene recording started.
09:56:37.55	SWS	-	-	-	-	Idling
09:56:37.60	USH	-	-	-	-	Idling
09:56:37.85	LSH	-	-	-	-	Idling
09:56:40.36	SWS	174.0	-	-	-	Telescope sent to -6.000
09:56:42.08	SWS	-4.6	-	-	-	Telescope stopped.
09:56:42.75	SWS	-	-	-	-	Manual scene recording started.
09:56:42.76	LSH	-	-	-	-	Manual scene recording started.
09:56:42.77	USH	-	-	-	-	Manual scene recording started.
09:56:45.66	SWS	-	-	-	-	Dark measurement started.
09:56:45.70	USH	-	-	-	-	Dark measurement started.
09:56:45.72	LSH	-	-	-	-	Dark measurement started.
09:56:46.43	SWS	-	-	-	-	Manual scene recording started.
09:56:46.82	USH	-	-	-	-	Manual scene recording started.
09:56:50.52	LSH	-	-	-	-	Manual scene recording started.
09:59:39.58	---	-	-	-	-	*** 10 deg
10:00:31.62	---	-	-	-	-	*** 11 deg
10:02:09.81	---	-	-	-	-	*** run at 500 ft (5.1)
10:02:13.46	---	-	-	-	-	*** 12 deg
10:03:10.76	SWS	-	-	-	-	Dark measurement started.
10:03:10.79	USH	-	-	-	-	Dark measurement started.
10:03:10.87	LSH	-	-	-	-	Dark measurement started.
10:03:11.55	SWS	-	-	-	-	Manual scene recording started.
10:03:11.97	USH	-	-	-	-	Manual scene recording started.
10:03:15.64	LSH	-	-	-	-	Manual scene recording started.
10:03:15.72	USH	-	-	-	-	Idling
10:03:15.79	SWS	-	-	-	-	Idling
10:03:16.27	LSH	-	-	-	-	Idling
10:03:17.39	SWS	-6.0	-	-	-	Telescope sent to 174.000
10:03:19.10	SWS	172.9	-	-	-	Telescope stopped.
10:03:20.39	SWS	-	-	-	-	Manual scene recording started.
10:03:20.40	LSH	-	-	-	-	Manual scene recording started.
10:03:20.41	USH	-	-	-	-	Manual scene recording started.
10:03:23.77	LSH	-	-	-	-	Dark measurement started.
10:03:23.86	USH	-	-	-	-	Dark measurement started.
10:03:23.89	SWS	-	-	-	-	Dark measurement started.
10:03:24.94	SWS	-	-	-	-	Manual scene recording started.
10:03:24.94	USH	-	-	-	-	Manual scene recording started.
10:03:28.25	LSH	-	-	-	-	Manual scene recording started.
10:05:44.12	USH	-	-	-	-	Idling
10:05:44.15	LSH	-	-	-	-	Idling
10:05:44.21	SWS	-	-	-	-	Idling
10:05:46.77	SWS	174.0	-	-	-	Telescope sent to -6.000
10:05:48.52	SWS	-5.9	-	-	-	Telescope stopped.
10:05:49.27	USH	-	-	-	-	Manual scene recording started.
10:05:49.28	LSH	-	-	-	-	Manual scene recording started.
10:05:49.29	SWS	-	-	-	-	Manual scene recording started.
10:05:51.70	USH	-	-	-	-	Dark measurement started.
10:05:51.73	SWS	-	-	-	-	Dark measurement started.

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10:05:51.80  LSH      -     -     -     -  Dark measurement started.
10:05:52.69  SWS      -     -     -     -  Manual scene recording started.
10:05:52.81  USH      -     -     -     -  Manual scene recording started.
10:05:56.58  LSH      -     -     -     -  Manual scene recording started.
10:06:06.08  ---      -     -     -     -  *** 12 deg
10:09:24.24  ---      -     -     -     -  *** 13 deg
10:11:58.32  USH      -     -     -     -  Dark measurement started.
10:11:58.39  LSH      -     -     -     -  Dark measurement started.
10:11:58.42  SWS      -     -     -     -  Dark measurement started.
10:11:59.31  USH      -     -     -     -  Manual scene recording started.
10:11:59.52  SWS      -     -     -     -  Manual scene recording started.
10:12:02.98  LSH      -     -     -     -  Manual scene recording started.
10:13:09.68  ---      -     -     -     -  *** profile climb (18)
10:14:24.07  ---      -     -     -     -  *** end of profile
10:14:53.58  ---      -     -     -     -  *** run
10:15:20.22  ---      -     -     -     -  *** below cloud run
10:15:56.21  ---      -     -     -     -  *** run 5.2
10:25:29.65  ---      -     -     -     -  *** end of run
10:25:35.34  ---      -     -     -     -  *** profile climb 19
10:27:11.37  USH      -     -     -     -  Dark measurement started.
10:27:11.44  SWS      -     -     -     -  Dark measurement started.
10:27:11.48  LSH      -     -     -     -  Dark measurement started.
10:27:12.35  SWS      -     -     -     -  Manual scene recording started.
10:27:12.37  USH      -     -     -     -  Manual scene recording started.
10:27:16.24  LSH      -     -     -     -  Manual scene recording started.
10:27:38.60  ---      -     -     -     -  *** enterin cloud
10:28:23.46  ---      -     -     -     -  *** run 5.3 in cloud
10:29:01.28  SWS      -     -     -     -  Dark measurement started.
10:29:01.38  USH      -     -     -     -  Dark measurement started.
10:29:01.67  LSH      -     -     -     -  Dark measurement started.
10:29:02.04  SWS      -     -     -     -  Manual scene recording started.
10:29:02.49  USH      -     -     -     -  Manual scene recording started.
10:29:06.13  LSH      -     -     -     -  Manual scene recording started.
10:29:26.71  LSH      -     -     -     -  Idling
10:29:26.74  SWS      -     -     -     -  Idling
10:29:26.81  USH      -     -     -     -  Idling
10:29:29.22  SWS   -6.0     -     -     -  Telescope sent to 174.000
10:29:30.94  SWS  173.3     -     -     -  Telescope stopped.
10:29:32.33  SWS      -     -     -     -  Manual scene recording started.
10:29:32.34  LSH      -     -     -     -  Manual scene recording started.
10:29:32.36  USH      -     -     -     -  Manual scene recording started.
10:29:34.96  USH      -     -     -     -  Dark measurement started.
10:29:35.03  SWS      -     -     -     -  Dark measurement started.
10:29:35.30  LSH      -     -     -     -  Dark measurement started.
10:29:35.95  SWS      -     -     -     -  Manual scene recording started.
10:29:36.05  USH      -     -     -     -  Manual scene recording started.
10:29:40.36  LSH      -     -     -     -  Manual scene recording started.
10:29:40.98  LSH      -     -     -     -  Manual scene recording started.
10:31:03.47  USH      -     -     -     -  Idling
10:31:03.54  SWS      -     -     -     -  Idling
10:31:03.59  LSH      -     -     -     -  Idling
10:31:05.53  SWS  174.0     -     -     -  Telescope sent to -6.000
10:31:07.21  SWS   -4.0     -     -     -  Telescope stopped.
10:31:08.62  SWS      -     -     -     -  Manual scene recording started.
10:31:08.63  LSH      -     -     -     -  Manual scene recording started.
10:31:08.64  USH      -     -     -     -  Manual scene recording started.
10:31:10.22  SWS      -     -     -     -  Dark measurement started.
10:31:10.23  USH      -     -     -     -  Dark measurement started.
10:31:10.30  LSH      -     -     -     -  Dark measurement started.
10:31:11.00  SWS      -     -     -     -  Manual scene recording started.
10:31:11.41  USH      -     -     -     -  Manual scene recording started.
10:31:15.12  LSH      -     -     -     -  Manual scene recording started.
10:38:16.22  ---      -     -     -     -  *** end of run
10:38:26.30  ---      -     -     -     -  *** profile 20 (up)
10:39:29.76  ---      -     -     -     -  *** cloud top at 48
10:40:05.70  LSH      -     -     -     -  Idling
10:40:05.73  SWS      -     -     -     -  Idling
10:40:05.79  USH      -     -     -     -  Idling
10:40:08.71  SWS   -6.0     -     -     -  Telescope sent to 174.000
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10:40:10.46  SWS  173.8     -     -     -  Telescope stopped.
10:40:11.53  USH      -     -     -     -  Manual scene recording started.
10:40:11.54  LSH      -     -     -     -  Manual scene recording started.
10:40:11.56  SWS      -     -     -     -  Manual scene recording started.
10:40:14.95  SWS      -     -     -     -  Dark measurement started.
10:40:15.03  USH      -     -     -     -  Dark measurement started.
10:40:15.12  LSH      -     -     -     -  Dark measurement started.
10:40:15.69  SWS      -     -     -     -  Manual scene recording started.
10:40:16.11  USH      -     -     -     -  Manual scene recording started.
10:40:19.80  LSH      -     -     -     -  Manual scene recording started.
10:40:48.39  ---      -     -     -     -  *** profile 21 descending
10:41:49.50  ---      -     -     -     -  *** 12 deg
10:42:02.23  ---      -     -     -     -  *** going into cloud
10:42:35.43  ---      -     -     -     -  *** run 5.4 in cloud to overpass Ron Brown
10:42:50.98  SWS      -     -     -     -  Dark measurement started.
10:42:51.05  USH      -     -     -     -  Dark measurement started.
10:42:51.32  LSH      -     -     -     -  Dark measurement started.
10:42:51.75  SWS      -     -     -     -  Manual scene recording started.
10:42:52.15  USH      -     -     -     -  Manual scene recording started.
10:42:55.86  LSH      -     -     -     -  Manual scene recording started.
10:43:50.10  USH      -     -     -     -  Idling
10:43:50.10  SWS      -     -     -     -  Idling
10:43:50.38  LSH      -     -     -     -  Idling
10:43:52.54  SWS  174.0     -     -     -  Telescope sent to -6.000
10:43:54.27  SWS   -5.4     -     -     -  Telescope stopped.
10:43:54.86  SWS      -     -     -     -  Manual scene recording started.
10:43:54.87  LSH      -     -     -     -  Manual scene recording started.
10:43:54.88  USH      -     -     -     -  Manual scene recording started.
10:44:01.17  SWS      -     -     -     -  Dark measurement started.
10:44:01.21  LSH      -     -     -     -  Dark measurement started.
10:44:01.25  USH      -     -     -     -  Dark measurement started.
10:44:01.93  SWS      -     -     -     -  Manual scene recording started.
10:44:02.57  USH      -     -     -     -  Manual scene recording started.
10:44:05.83  LSH      -     -     -     -  Manual scene recording started.
10:45:57.82  SWS      -     -     -     -  Idling
10:45:57.89  USH      -     -     -     -  Idling
10:45:58.01  LSH      -     -     -     -  Idling
10:46:00.02  SWS   -6.0     -     -     -  Telescope sent to 174.000
10:46:01.75  SWS  173.6     -     -     -  Telescope stopped.
10:46:04.20  SWS      -     -     -     -  Manual scene recording started.
10:46:04.21  LSH      -     -     -     -  Manual scene recording started.
10:46:04.22  USH      -     -     -     -  Manual scene recording started.
10:46:06.54  LSH      -     -     -     -  Dark measurement started.
10:46:06.56  USH      -     -     -     -  Dark measurement started.
10:46:06.61  SWS      -     -     -     -  Dark measurement started.
10:46:07.73  SWS      -     -     -     -  Manual scene recording started.
10:46:07.73  USH      -     -     -     -  Manual scene recording started.
10:46:10.76  USH      -     -     -     -  Dark measurement started.
10:46:10.79  SWS      -     -     -     -  Dark measurement started.
10:46:11.02  LSH      -     -     -     -  Manual scene recording started.
10:46:11.72  SWS      -     -     -     -  Manual scene recording started.
10:46:11.73  USH      -     -     -     -  Manual scene recording started.
10:47:31.74  ---      -     -     -     -  *** 12 deg
10:47:54.06  USH      -     -     -     -  Idling
10:47:54.08  SWS      -     -     -     -  Idling
10:47:54.15  LSH      -     -     -     -  Idling
10:47:56.01  SWS  174.0     -     -     -  Telescope sent to -6.000
10:47:57.67  SWS   -3.2     -     -     -  Telescope stopped.
10:47:58.34  USH      -     -     -     -  Manual scene recording started.
10:47:58.34  LSH      -     -     -     -  Manual scene recording started.
10:47:58.36  SWS      -     -     -     -  Manual scene recording started.
10:48:11.90  ---      -     -     -     -  *** over ship now
10:48:33.17  USH      -     -     -     -  Dark measurement started.
10:48:33.24  SWS      -     -     -     -  Dark measurement started.
10:48:33.50  LSH      -     -     -     -  Dark measurement started.
10:48:34.17  USH      -     -     -     -  Manual scene recording started.
10:48:34.26  SWS      -     -     -     -  Manual scene recording started.
10:48:38.03  LSH      -     -     -     -  Manual scene recording started.
10:50:08.27  ---      -     -     -     -  *** 11 deg
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10:52:11.81  USH      -     -     -     -  Idling
10:52:11.88  SWS      -     -     -     -  Idling
10:52:12.02  LSH      -     -     -     -  Idling
10:52:13.94  SWS   -6.0     -     -     -  Telescope sent to 174.000
10:52:15.70  SWS  174.0     -     -     -  Telescope stopped.
10:52:17.12  LSH      -     -     -     -  Manual scene recording started.
10:52:17.12  USH      -     -     -     -  Manual scene recording started.
10:52:17.14  SWS      -     -     -     -  Manual scene recording started.
10:52:36.76  ---      -     -     -     -  *** profile ascent
10:53:05.59  ---      -     -     -     -  *** cloud top 4700 ft
10:53:52.16  USH      -     -     -     -  Dark measurement started.
10:53:52.20  SWS      -     -     -     -  Dark measurement started.
10:53:52.39  LSH      -     -     -     -  Dark measurement started.
10:53:53.14  USH      -     -     -     -  Manual scene recording started.
10:53:53.17  SWS      -     -     -     -  Manual scene recording started.
10:53:57.46  LSH      -     -     -     -  Manual scene recording started.
10:54:05.64  USH      -     -     -     -  Idling
10:54:05.67  SWS      -     -     -     -  Idling
10:54:05.74  LSH      -     -     -     -  Idling
10:54:07.62  SWS  174.0     -     -     -  Telescope sent to -6.000
10:54:09.35  SWS   -5.0     -     -     -  Telescope stopped.
10:54:09.92  USH      -     -     -     -  Manual scene recording started.
10:54:09.92  LSH      -     -     -     -  Manual scene recording started.
10:54:09.94  SWS      -     -     -     -  Manual scene recording started.
10:54:11.98  USH      -     -     -     -  Dark measurement started.
10:54:12.01  SWS      -     -     -     -  Dark measurement started.
10:54:12.05  LSH      -     -     -     -  Dark measurement started.
10:54:12.93  USH      -     -     -     -  Manual scene recording started.
10:54:12.97  SWS      -     -     -     -  Manual scene recording started.
10:54:16.84  LSH      -     -     -     -  Manual scene recording started.
10:54:22.85  ---      -     -     -     -  *** profile descent to 50 ft
10:55:21.41  ---      -     -     -     -  *** going through cloud
10:56:49.36  ---      -     -     -     -  *** below cloud
11:00:56.33  USH      -     -     -     -  Dark measurement started.
11:00:56.36  LSH      -     -     -     -  Dark measurement started.
11:00:56.40  SWS      -     -     -     -  Dark measurement started.
11:00:57.33  USH      -     -     -     -  Manual scene recording started.
11:00:57.52  SWS      -     -     -     -  Manual scene recording started.
11:01:01.00  LSH      -     -     -     -  Manual scene recording started.
11:02:56.44  ---      -     -     -     -  *** run 6.1 at 500 ft
11:05:36.59  ---      -     -     -     -  *** 11 deg
11:06:18.60  ---      -     -     -     -  *** 10 deg
11:07:50.39  ---      -     -     -     -  *** 11 deg
11:08:33.16  USH      -     -     -     -  Idling
11:08:33.18  SWS      -     -     -     -  Idling
11:08:33.37  LSH      -     -     -     -  Idling
11:08:34.87  SWS   -6.0     -     -     -  Telescope sent to 174.000
11:08:36.54  ---      -     -     -     -  Reset shutters.
11:08:36.60  SWS  173.7     -     -     -  Telescope stopped.
11:08:40.44  SWS      -     -     -     -  Manual scene recording started.
11:08:40.45  LSH      -     -     -     -  Manual scene recording started.
11:08:40.46  USH      -     -     -     -  Manual scene recording started.
11:08:42.29  SWS      -     -     -     -  Dark measurement started.
11:08:42.34  USH      -     -     -     -  Dark measurement started.
11:08:42.59  LSH      -     -     -     -  Dark measurement started.
11:08:43.06  SWS      -     -     -     -  Manual scene recording started.
11:08:43.48  USH      -     -     -     -  Manual scene recording started.
11:08:47.18  LSH      -     -     -     -  Manual scene recording started.
11:11:05.36  LSH      -     -     -     -  Idling
11:11:05.38  SWS      -     -     -     -  Idling
11:11:05.43  USH      -     -     -     -  Idling
11:11:07.55  SWS  174.0     -     -     -  Telescope sent to -6.000
11:11:09.29  SWS   -5.7     -     -     -  Telescope stopped.
11:11:10.66  SWS      -     -     -     -  Manual scene recording started.
11:11:10.66  LSH      -     -     -     -  Manual scene recording started.
11:11:10.69  USH      -     -     -     -  Manual scene recording started.
11:11:12.61  SWS      -     -     -     -  Dark measurement started.
11:11:12.65  USH      -     -     -     -  Dark measurement started.
11:11:12.78  LSH      -     -     -     -  Dark measurement started.
```

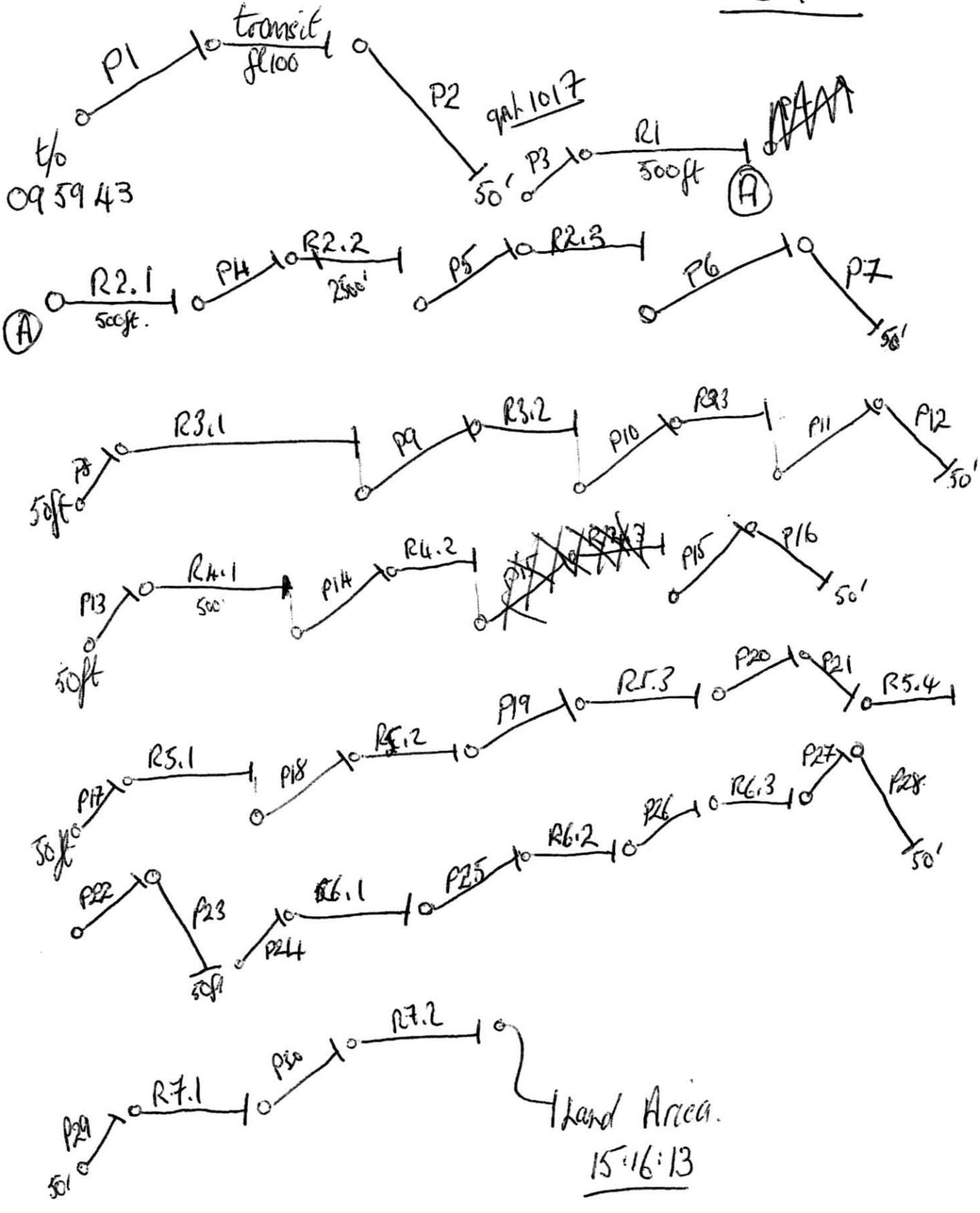
```
11:11:13.36  SWS      -     -     -     -  Manual scene recording started.
11:11:13.76  USH      -     -     -     -  Manual scene recording started.
11:11:17.48  LSH      -     -     -     -  Manual scene recording started.
11:12:00.79  ---      -     -     -     -  *** 11 deg
11:13:44.29  ---      -     -     -     -  *** profile climb
11:16:10.44  ---      -     -     -     -  *** run at 2900 ft
11:16:23.94  ---      -     -     -     -  *** below cloud run 6.2
11:18:37.25  ---      -     -     -     -  *** 12 deg
11:21:04.51  ---      -     -     -     -  *** skimming bottom of cloud
11:22:12.88  ---      -     -     -     -  *** 13 deg
11:26:49.25  ---      -     -     -     -  *** profile climb to 4300 ft
11:28:26.60  ---      -     -     -     -  *** run at 3800 ft in cloud
11:28:34.44  ---      -     -     -     -  *** run 6.3
11:29:34.08  ---      -     -     -     -  *** 14 deg
11:29:37.67  LSH      -     -     -     -  Dark measurement started.
11:29:37.73  SWS      -     -     -     -  Dark measurement started.
11:29:37.79  USH      -     -     -     -  Dark measurement started.
11:29:38.70  SWS      -     -     -     -  Manual scene recording started.
11:29:39.04  USH      -     -     -     -  Manual scene recording started.
11:29:42.12  LSH      -     -     -     -  Manual scene recording started.
11:32:33.91  SWS      -     -     -     -  Idling
11:32:33.98  USH      -     -     -     -  Idling
11:32:34.17  LSH      -     -     -     -  Idling
11:32:35.86  SWS   -6.0     -     -     -  Telescope sent to 174.000
11:32:37.59  SWS  173.6     -     -     -  Telescope stopped.
11:32:39.34  SWS      -     -     -     -  Manual scene recording started.
11:32:39.34  LSH      -     -     -     -  Manual scene recording started.
11:32:39.36  USH      -     -     -     -  Manual scene recording started.
11:32:41.69  USH      -     -     -     -  Dark measurement started.
11:32:41.80  SWS      -     -     -     -  Dark measurement started.
11:32:41.87  LSH      -     -     -     -  Dark measurement started.
11:32:42.66  SWS      -     -     -     -  Manual scene recording started.
11:32:42.66  USH      -     -     -     -  Manual scene recording started.
11:32:46.55  LSH      -     -     -     -  Manual scene recording started.
11:33:16.67  ---      -     -     -     -  *** 14 deg
11:34:59.02  ---      -     -     -     -  *** point A
11:35:34.72  LSH      -     -     -     -  Idling
11:35:34.76  USH      -     -     -     -  Idling
11:35:34.78  SWS      -     -     -     -  Idling
11:35:36.91  SWS  174.0     -     -     -  Telescope sent to -6.000
11:35:38.66  SWS   -5.7     -     -     -  Telescope stopped.
11:35:39.85  SWS      -     -     -     -  Manual scene recording started.
11:35:39.86  LSH      -     -     -     -  Manual scene recording started.
11:35:39.87  USH      -     -     -     -  Manual scene recording started.
11:35:43.79  SWS      -     -     -     -  Dark measurement started.
11:35:43.88  USH      -     -     -     -  Dark measurement started.
11:35:44.09  LSH      -     -     -     -  Dark measurement started.
11:35:44.56  SWS      -     -     -     -  Manual scene recording started.
11:35:44.99  USH      -     -     -     -  Manual scene recording started.
11:35:48.67  LSH      -     -     -     -  Manual scene recording started.
11:36:56.89  SWS      -     -     -     -  Warning: Clipping may be occurring.
11:36:59.62  SWS      -     -     -     -  Warning: Clipping may be occurring.
11:39:24.63  SWS      -     -     -     -  Dark measurement started.
11:39:24.72  USH      -     -     -     -  Dark measurement started.
11:39:24.81  LSH      -     -     -     -  Dark measurement started.
11:39:25.42  SWS      -     -     -     -  Manual scene recording started.
11:39:25.85  USH      -     -     -     -  Manual scene recording started.
11:39:29.52  LSH      -     -     -     -  Manual scene recording started.
11:39:46.11  SWS      -     -     -     -  Dark measurement started.
11:39:46.16  USH      -     -     -     -  Dark measurement started.
11:39:46.25  LSH      -     -     -     -  Dark measurement started.
11:39:46.88  SWS      -     -     -     -  Manual scene recording started.
11:39:47.33  USH      -     -     -     -  Manual scene recording started.
11:39:50.98  LSH      -     -     -     -  Manual scene recording started.
11:39:58.94  ---      -     -     -     -  *** cloud top at 4200 ft
11:40:37.10  SWS      -     -     -     -  Idling
11:40:37.17  USH      -     -     -     -  Idling
11:40:37.45  LSH      -     -     -     -  Idling
11:40:38.62  SWS   -6.0     -     -     -  Telescope sent to 174.000
```

```
11:40:40.41  SWS  174.0     -      -      -  Telescope stopped.
11:40:41.42  SWS      -     -      -      -  Manual scene recording started.
11:40:41.42  LSH      -     -      -      -  Manual scene recording started.
11:40:41.45  USH      -     -      -      -  Manual scene recording started.
11:40:43.86  SWS      -     -      -      -  Dark measurement started.
11:40:43.90  USH      -     -      -      -  Dark measurement started.
11:40:43.96  LSH      -     -      -      -  Dark measurement started.
11:40:44.62  SWS      -     -      -      -  Manual scene recording started.
11:40:45.03  USH      -     -      -      -  Manual scene recording started.
11:40:48.61  SWS      -     -     20      -  VIS int.time changed from 30ms to 20ms.
11:40:48.62  SWS      -     -      -     20  NIR int.time changed from 30ms to 20ms.
11:40:48.72  LSH      -     -      -      -  Manual scene recording started.
11:40:52.85  USH      -     -     30      -  VIS int.time changed from 50ms to 30ms.
11:40:52.86  USH      -     -      -     30  NIR int.time changed from 50ms to 30ms.
11:40:54.84  USH      -     -      -      -  Dark measurement started.
11:40:54.88  SWS      -     -      -      -  Dark measurement started.
11:40:55.06  LSH      -     -      -      -  Dark measurement started.
11:40:55.64  USH      -     -      -      -  Manual scene recording started.
11:40:55.72  SWS      -     -      -      -  Manual scene recording started.
11:40:57.11  USH      -     -      -      -  Dark measurement started.
11:40:57.19  SWS      -     -      -      -  Dark measurement started.
11:40:57.88  USH      -     -      -      -  Manual scene recording started.
11:40:57.98  SWS      -     -      -      -  Manual scene recording started.
11:41:00.17  LSH      -     -      -      -  Manual scene recording started.
11:41:05.81  USH      -     -      -      -  Dark measurement started.
11:41:05.87  SWS      -     -      -      -  Dark measurement started.
11:41:05.92  LSH      -     -      -      -  Dark measurement started.
11:41:06.64  USH      -     -      -      -  Manual scene recording started.
11:41:06.71  SWS      -     -      -      -  Manual scene recording started.
11:41:10.70  LSH      -     -      -      -  Manual scene recording started.
11:41:14.68  USH      -     -      -      -  Dark measurement started.
11:41:14.70  SWS      -     -      -      -  Dark measurement started.
11:41:14.74  LSH      -     -      -      -  Dark measurement started.
11:41:15.49  USH      -     -      -      -  Manual scene recording started.
11:41:15.60  SWS      -     -      -      -  Manual scene recording started.
11:41:19.54  LSH      -     -      -      -  Manual scene recording started.
11:41:51.13  ---      -     -      -      -  *** going into cloud
11:41:57.49  ---      -     -      -      -  *** cloud top 4200 ft
11:43:15.44  USH      -     -      -      -  Idling
11:43:15.47  SWS      -     -      -      -  Idling
11:43:15.51  LSH      -     -      -      -  Idling
11:43:17.36  SWS  174.0     -      -      -  Telescope sent to -6.000
11:43:19.11  SWS   -5.8     -      -      -  Telescope stopped.
11:43:20.03  SWS      -     -      -      -  Manual scene recording started.
11:43:20.03  LSH      -     -      -      -  Manual scene recording started.
11:43:20.05  USH      -     -      -      -  Manual scene recording started.
11:43:22.25  SWS      -     -      -      -  Dark measurement started.
11:43:22.28  USH      -     -      -      -  Dark measurement started.
11:43:22.58  LSH      -     -      -      -  Dark measurement started.
11:43:22.92  SWS      -     -      -      -  Manual scene recording started.
11:43:23.25  USH      -     -      -      -  Manual scene recording started.
11:43:27.11  LSH      -     -      -      -  Manual scene recording started.
11:46:32.91  ---      -     -      -      -  *** 13 deg
11:47:02.98  ---      -     -      -      -  *** 50 ft
11:47:32.64  ---      -     -      -      -  *** run at 500 ft
11:47:43.32  ---      -     -      -      -  *** run 7.1
11:49:09.58  USH      -     -      -      -  Dark measurement started.
11:49:09.64  SWS      -     -      -      -  Dark measurement started.
11:49:09.85  LSH      -     -      -      -  Dark measurement started.
11:49:10.41  USH      -     -      -      -  Manual scene recording started.
11:49:10.51  SWS      -     -      -      -  Manual scene recording started.
11:49:14.43  LSH      -     -      -      -  Manual scene recording started.
11:49:20.96  SWS      -     -      -      -  Idling
11:49:21.00  LSH      -     -      -      -  Idling
11:49:21.04  USH      -     -      -      -  Idling
11:49:24.27  SWS   -6.0     -      -      -  Telescope sent to 174.000
11:49:26.01  SWS  173.9     -      -      -  Telescope stopped.
11:49:27.07  LSH      -     -      -      -  Manual scene recording started.
11:49:27.08  USH      -     -      -      -  Manual scene recording started.
```

```
11:49:27.09  SWS      -     -     -     -  Manual scene recording started.
11:50:43.97  USH      -     -     -     -  Idling
11:50:44.00  SWS      -     -     -     -  Idling
11:50:44.04  LSH      -     -     -     -  Idling
11:50:46.10  SWS  174.0     -     -     -  Telescope sent to -6.000
11:50:47.86  SWS   -5.9     -     -     -  Telescope stopped.
11:50:49.49  SWS      -     -     -     -  Manual scene recording started.
11:50:49.50  LSH      -     -     -     -  Manual scene recording started.
11:50:49.51  USH      -     -     -     -  Manual scene recording started.
11:50:52.08  SWS      -     -     -     -  Dark measurement started.
11:50:52.12  USH      -     -     -     -  Dark measurement started.
11:50:52.47  LSH      -     -     -     -  Dark measurement started.
11:50:52.78  SWS      -     -     -     -  Manual scene recording started.
11:50:53.10  USH      -     -     -     -  Manual scene recording started.
11:50:56.99  LSH      -     -     -     -  Manual scene recording started.
11:51:36.51  ---      -     -     -     -  *** 12 deg
11:57:03.62  ---      -     -     -     -  *** large aerosol increase here
11:57:21.54  ---      -     -     -     -  *** ie an increase in number of large aerosol
                                             particles
11:57:25.26  LSH      -     -     -     -  Dark measurement started.
11:57:25.30  USH      -     -     -     -  Dark measurement started.
11:57:25.34  SWS      -     -     -     -  Dark measurement started.
11:57:26.24  USH      -     -     -     -  Manual scene recording started.
11:57:26.42  SWS      -     -     -     -  Manual scene recording started.
11:57:29.73  LSH      -     -     -     -  Manual scene recording started.
11:57:35.36  ---      -     -     -     -  *** 11 deg
11:57:39.83  ---      -     -     -     -  *** profile climb
11:59:49.66  ---      -     -     -     -  *** in cloud run at 3700 ft (run 7.2)
12:00:15.17  ---      -     -     -     -  *** run at 7.2 at 3600 ft
12:01:45.22  USH      -     -     -     -  Dark measurement started.
12:01:45.25  SWS      -     -     -     -  Dark measurement started.
12:01:45.35  LSH      -     -     -     -  Dark measurement started.
12:01:45.99  USH      -     -     -     -  Manual scene recording started.
12:01:46.12  SWS      -     -     -     -  Manual scene recording started.
12:01:50.15  LSH      -     -     -     -  Manual scene recording started.
12:01:51.91  USH      -     -     -     -  Idling
12:01:51.92  SWS      -     -     -     -  Idling
12:01:52.07  LSH      -     -     -     -  Idling
12:01:53.83  SWS   -6.0     -     -     -  Telescope sent to 174.000
12:01:55.51  SWS  172.9     -     -     -  Telescope stopped.
12:01:56.65  SWS      -     -     -     -  Manual scene recording started.
12:01:56.66  LSH      -     -     -     -  Manual scene recording started.
12:01:56.68  USH      -     -     -     -  Manual scene recording started.
12:02:50.00  ---      -     -     -     -  *** 11 deg
12:03:14.67  SWS      -     -     -     -  Idling
12:03:14.70  USH      -     -     -     -  Idling
12:03:14.77  LSH      -     -     -     -  Idling
12:03:18.03  SWS  174.0     -     -     -  Telescope sent to -6.000
12:03:19.79  SWS   -5.9     -     -     -  Telescope stopped.
12:03:20.84  SWS      -     -     -     -  Manual scene recording started.
12:03:20.84  LSH      -     -     -     -  Manual scene recording started.
12:03:20.88  USH      -     -     -     -  Manual scene recording started.
12:03:25.94  USH      -     -     -     -  Dark measurement started.
12:03:25.98  LSH      -     -     -     -  Dark measurement started.
12:03:26.02  SWS      -     -     -     -  Dark measurement started.
12:03:26.73  USH      -     -     -     -  Manual scene recording started.
12:03:27.04  SWS      -     -     -     -  Manual scene recording started.
12:03:30.65  LSH      -     -     -     -  Manual scene recording started.
12:03:34.57  SWS      -     -     -     -  Dark measurement started.
12:03:34.68  USH      -     -     -     -  Dark measurement started.
12:03:34.71  LSH      -     -     -     -  Dark measurement started.
12:03:35.23  SWS      -     -     -     -  Manual scene recording started.
12:03:35.60  USH      -     -     -     -  Manual scene recording started.
12:03:39.46  LSH      -     -     -     -  Manual scene recording started.
12:03:48.77  ---      -     -     -     -  *** 10 deg
12:04:30.97  ---      -     -     -     -  *** 11 deg
12:04:34.22  SWS      -     -     -     -  Dark measurement started.
12:04:34.25  USH      -     -     -     -  Dark measurement started.
12:04:34.45  LSH      -     -     -     -  Dark measurement started.
```

```
12:04:34.89  SWS      -     -     -     -  Manual scene recording started.
12:04:35.21  USH      -     -     -     -  Manual scene recording started.
12:04:38.92  USH      -     -     -     -  Dark measurement started.
12:04:39.00  SWS      -     -     -     -  Dark measurement started.
12:04:39.16  LSH      -     -     -     -  Manual scene recording started.
12:04:39.69  USH      -     -     -     -  Manual scene recording started.
12:04:39.81  SWS      -     -     -     -  Manual scene recording started.
12:05:40.83  SWS      -     -     -     -  Dark measurement started.
12:05:40.88  USH      -     -     -     -  Dark measurement started.
12:05:40.94  LSH      -     -     -     -  Dark measurement started.
12:05:41.55  SWS      -     -     -     -  Manual scene recording started.
12:05:41.85  USH      -     -     -     -  Manual scene recording started.
12:05:45.76  LSH      -     -     -     -  Manual scene recording started.
12:22:13.96  ---      -     -     -     -  *** 14 deg
```

BM0


P1
transit
fl100
P2
t/o
09 59 43
9AM 1017
50'
P3
R1
500ft
A
A
R2.1
500ft.
P4
R2.2
250'
P5
R2.3
P6
P7
50'
50ft
P8
R3.1
P9
R3.2
P10
R3.3
P11
P12
50'
P13
R4.1
500'
P14
R4.2
P15
P16
50'
50ft
P17
R5.1
50ft
P18
R5.2
P19
R5.3
P20
P21
R5.4
P22
P23
50ft
P24
R6.1
P25
R6.2
P26
R6.3
P27
P28
50'
P29
50'
R7.1
P30
R7.2
Land Area.
15:16:13

12:15

Flight: B410

KEY

- Not Fitted
- Fitted, Not Operated
- Duff Data
- Minor Problem
- OK

Thermometers
- Cabin Temperature:
- Heimann:
- Deiced Temp:
- Non-deiced Temp:

Hygrometers
- FWVS:
- Buck CR2:
- General Eastern:
- Johnson Williams:
- Nevzorov:
- Total Water Probe:

Cameras
- Downward Facing:
- Forward Facing:
- Rearward Facing:
- Upward Facing:

Navigation + Aircraft
- Cruciform GPS:
- GIN Applanix:
- INU Honeywell:
- Radar Altimeter:
- RVSM IAS:
- RVSM Static Pressure:
- XR5 GPS:

Misc Core
- HORACE:
- AMTG:
- AVAPS:
- Cabin Pressure:
- Printer:
- S9 Static Pressure:
- Satcom C:
- Satcom H (VIRC):
- Turb Centre-Static:
- Turb Left Right:
- Turb Up-Down:
- Turb Horizontal Chk:
- Turb Vertical Chk:
- Weather Radar:

DLUs:
- DLU AERACK:
- DLU BBR Lower:
- DLU BBR Upper:
- DLU Core Chem:
- DLU Core Consoles:
- DLU Port Aft:
- DLU Port Fwd:
- DLU Stbd Fwd:

Radiometers
Lower:
- BBR (clear) Lower:
- BBR (IR) Lower:
- BBR (red) Lower:

Upper:
- BBR (clear) Upper:
- BBR (IR) Upper:
- BBR (red) Upper:

- ARIES:
- DEIMOS:
- IR Camera:
- JNO2 Lower:
- JNO2 Upper:
- JO1D Lower:
- JO1D Upper:
- MARSS:
- SHIMS Lower:
- SHIMS Upper:
- SWS:
- TAFTS:

Cloud Probes
- 2DC:
- 2DP:
- FFSSP:
- PCASP:
- PCASP SPP-200:
- 2DS:
- ADA:
- CAPS:
- CCN:
- CDP (fuselage):
- CDP (Canister):
- CIP 100 (PIP):
- CIP 25 (CIP):
- CPI:
- CVI (Inlet):
- CVI PCASP-X:
- CVI Ly-A Hygro:
- FSSP (UMan):
- SID1:
- SID2:
- SID3:

Aerosol
- CPC 3025A:
- CPC 3786 H2O:
- Filters 47mm:
- Filters 90mm:
- Neph - Dry:
- Neph - Wet:
- PSAP:
- AMS:
- CPC (AMS):
- SMPS (AMS):
- CPC 3010A (CVI):
- INC:
- Mini-LIDAR:
- SP2:
- UHSAS:
- VACC:

Chemistry
- CO Aerolaser 5002:
- NOx TE42C:
- Ozone TE49C:
- Ozone TE49:
- SO2 TE43C:
- TDLAS (NIR) CH4:
- TDLAS (NIR) CO2:
- FAGE:
- Formaldehyde:
- NOx FAAM:
- NOxy:
- ORAC:
- PAN:
- PERCA:
- Peroxide:
- PTRMS:
- TDLAS (1C):
- WAS Bags:
- WAS Bottles:

Misc Non-Core
- CASI/ATM:
- LIDAR (big):
- LTI:
- SAW Hygrometer:

Report Created 15/09/2009 14:21:52

Last Updated: 21/11/2008 14:16:44

Faults / Incidents Log

Flight No. B410
Date: 29/oct/08

Instruments

CVI -	ok (no CPC)
Neph	ok
PSAP	ok
WetNeph	mostly ok – some comms problems persist
Filters	pipework needs cleaning
SWS -	ok, using manual shutter control
SHIMS -	upper ok
	Lower not working
AMS	ok
Core Chem -	CO good, using manual cals
	SO2 ok
	Nox ok
	O3 ok
Cloud physics -	PCASP needs cleaning
	FSSP ok
ARIES -	ok
MARSS -	run unmanned
CCN -	no data on outbound leg, good data on return
VACC -	good operation
2DS -	ok
CAPS -	ok
SMPS -	ok
Buck -	not operated

Aircraft

ISDN Emails
1 email

MPDS
Run for approx 4 hours

Satcom-H Calls
nil

Issues
Upper BBRs need cleaning before every flight

Pre-Flighter's Log

Date: 29/10/8 Flight No: B410 Pre-Flighter: Graham

No.	√ or x	Location	Action	Comments
1	✓	Hangar	Collect spanners for core chem	
		Aircraft Cabin: Power-up		
2	✓	Core Chemistry	Gases x 3 ON	Doug
3		Cabin	All Racks Checked	
4	✓	Core Chemistry	Instruments Checked OK	Doug
5	✓	Core Chemistry	CO Flows Checked OK	
6	✓	Aft CorCon	All reqd CBs made	
7	✓	Fore CorCon	CBs made, PCs ON	
8	✓	HORACE	Optical Disk loaded	
9	✓	HORACE	Recording data	
10	✓	HORACE	DLU Status Checked	
11	✓	HORACE	HORACE Status Checked	
12	✓	Satcom H	Power LED ON	
13	✓	Nevzorov	Checked and OFF	
14	✓	Cameras Pictures	Checked x 4 OK	
15	✓	Video Laptop	Checked onboard	
16	✓	FWVS	Set up & check on **AUTO**	Left to operator
17	✓	Delced Rosemount	Heater Checked then OFF	
18	✓	Heimann	Calibration Checked	
19	✓	TWC	Fitted & signals checked	
20	✓	GE	Balance checked then back to DP	
21	✓	GPS (XR5M)	Checked	
22	✓	Satcom C	Checked	
23	✓	Video x 2	Records okay ~~Rewind~~	

No.	√ or x	Location	Action	Comments
24	✓	Miss. Sci Laptop	Checked Onboard	In cockpit
25		CNC	Butanol filled	Left to operator
26		Dry Neph	Power up & Zero Cal	
27		PSAP	Pre-flight log actions complete	
28		CGPS	CBs and PC ON	
		External Checks		
29	✓	Turb Probe	Clean if reqd, Photo taken	
30	✓	JW	Cleaned & Checked	
31	✓	DI Rosemount	Cleaned & Checked	
32	✓	NDI Rosemount	Cleaned & Checked	
33		Nevzorov	Cleaned/windings checked	
34	✓	GE	Cleaned & Checked	
35	✓	Lower BBRs	Domes cleaned/checked	Avalon have also cleaned upper BBRs
36	✓	Camera Windows	Cleaned	
37	✓	Heimann	Lens checked OK	
38	✓	TWC Cover	Fitted if required	
39	✓	All other covers	Removed	
40		Pre-flight Bag	Returned to hold	** Check no butanol**
41		Tools	Check ALL in Toolkit	
42		Tools	Avalon informed	

		Avalon Checks	Signed
44		Upper BBRs Checked & Cleaned	
45		ICEX applied	
46		Turb Probe - Traps emptied, detail contents -	a)Nil b)1-2 drops c)1/4 full or more
47		Turb Probe - Traps dried and resealed	

MISSING LOG SHEETS:

The following log sheets are not available for flight B410:

Log	Reason
Instrument Status	may not be correct – Flight Manager asked to check
Cloud Physics Processing	No cloud physics processing logs are expected for VOCALS flights
MARSS	no log taken, operator was ill
VACC	Operator does not create a log sheet
2D-S / CAPS / CPI	2D-S / CAPS / CPI operator does not create a log sheet
AMS log	AMS operator does not create a log sheet
Buck Hygro note:	Buck not started until after take-off today - forgot about until seat belts were on for taxi. Initially network cable was loose but taped in place and Buck software restarted and running before belts on again.

Document control

Revision	Date	Author	Comments
r0	17 Feb 2009	Doug Anderson	Initial version missing the above noted logs
r1			
r2			

Digital video recordings in avi format:

faam-video-dfc_faam_20081029_r0_b410_095641_1hz.avi
faam-video-dfc_faam_20081029_r0_b410_105641_1hz.avi
faam-video-dfc_faam_20081029_r0_b410_115641_1hz.avi
faam-video-dfc_faam_20081029_r0_b410_125641_1hz.avi
faam-video-dfc_faam_20081029_r0_b410_135641_1hz.avi
faam-video-dfc_faam_20081029_r0_b410_145641_1hz.avi

faam-video-rfc_faam_20081029_r0_b410_095655_1hz.avi
faam-video-rfc_faam_20081029_r0_b410_105655_1hz.avi
faam-video-rfc_faam_20081029_r0_b410_115655_1hz.avi
faam-video-rfc_faam_20081029_r0_b410_125655_1hz.avi
faam-video-rfc_faam_20081029_r0_b410_135655_1hz.avi
faam-video-rfc_faam_20081029_r0_b410_145655_1hz.avi

faam-video-ffc_faam_20081029_r0_b410_095651_1hz.avi
faam-video-ffc_faam_20081029_r0_b410_105651_1hz.avi
faam-video-ffc_faam_20081029_r0_b410_115651_1hz.avi
faam-video-ffc_faam_20081029_r0_b410_125651_1hz.avi
faam-video-ffc_faam_20081029_r0_b410_135651_1hz.avi
faam-video-ffc_faam_20081029_r0_b410_145651_1hz.avi

faam-video-ufc_faam_20081029_r0_b410_095700_1hz.avi
faam-video-ufc_faam_20081029_r0_b410_105700_1hz.avi
faam-video-ufc_faam_20081029_r0_b410_115700_1hz.avi
faam-video-ufc_faam_20081029_r0_b410_125700_1hz.avi
faam-video-ufc_faam_20081029_r0_b410_135700_1hz.avi
faam-video-ufc_faam_20081029_r0_b410_145700_1hz.avi

No Digital8 video recordings were made on this flight.